# NEW ZEALAND JOURNAL OF Agriculture

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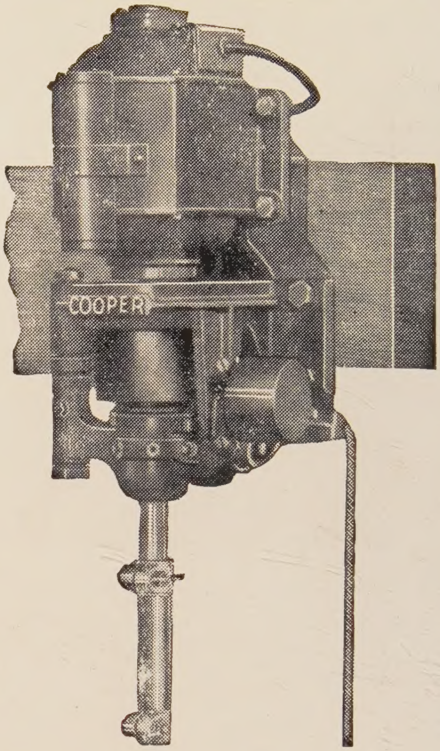

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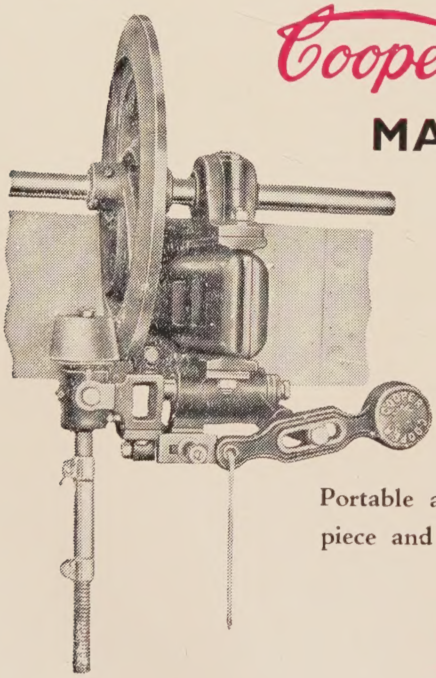

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## This month's cover

*Agricultural and pastoral shows have been a centre of interest for country people and scarcely less for those in towns and cities, and today more than 100 show associations hold annual fixtures. This month's cover, which is reproduced from a transparency (natural-colour photograph) by National Publicity Studios, shows a typical scene at a grand parade, the most spectacular event on the show programme. Show activities were seriously curtailed during the war, but there has been a marked revival in recent years and the popularity of the various district functions has been reflected in the excellent support from exhibitors and spectators.*

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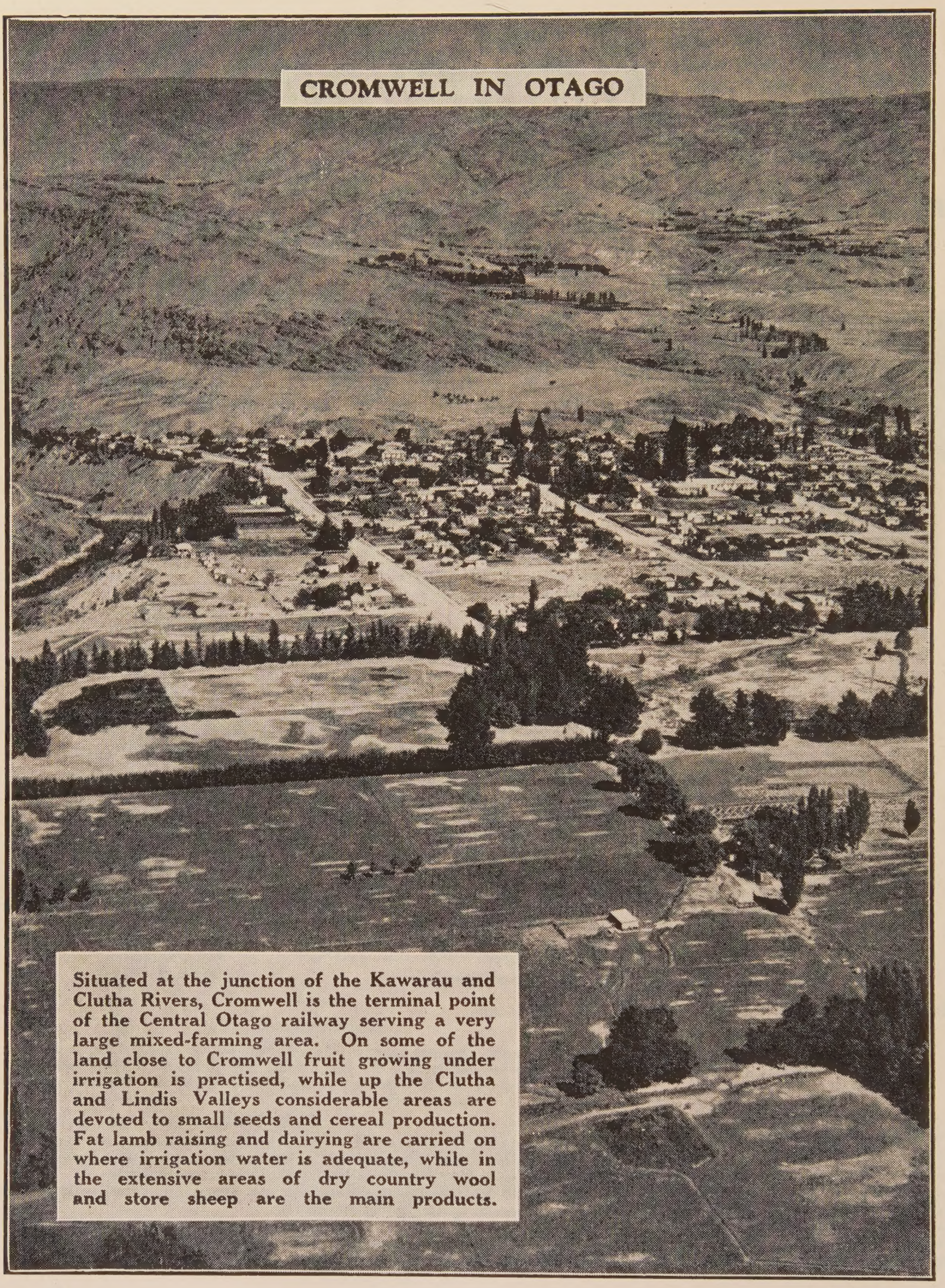
# CROMWELL IN OTAGO



Situated at the junction of the Kawarau and Clutha Rivers, Cromwell is the terminal point of the Central Otago railway serving a very large mixed-farming area. On some of the land close to Cromwell fruit growing under irrigation is practised, while up the Clutha and Lindis Valleys considerable areas are devoted to small seeds and cereal production. Fat lamb raising and dairying are carried on where irrigation water is adequate, while in the extensive areas of dry country wool and store sheep are the main products.

*[V. O. Browne photo*

# International Wheat Agreement Brings World Economic Co-operation Nearer

NEW ZEALAND is one of more than 40 countries which have signed the International Wheat Agreement, which was negotiated at a conference in Washington earlier this year and to which all members of the United Nations and of the Food and Agriculture Organization were invited to adhere. The original agreement from which this one arose was signed by 36 nations a year ago, but the United States Congress was undecided and failed to ratify the agreement within the time allowed. Largely because of that the agreement was unworkable, the United States being one of the principal suppliers, and it lapsed. Meantime, the world market for wheat has fallen from the high levels of the past two years, and more abundant harvests have had the effect of reducing the maximum price specified in the new agreement by 20 cents a bushel.

Despite the doubts and delay, we should rejoice that so many nations have resolved on this agreement, for it represents a significant international effort to resolve the twin world evils of food surpluses and hunger, though across its future falls the shadow of a question mark raised by the absence of two major wheat-exporting countries, Argentina and Russia. The agreement specifies maximum and minimum prices between the contracting nations for the next four years, but the effect of possible Argentine and Ukrainian surpluses dumped on the market at prices unrelated to the agreement cannot be predicted.

## Terms of Contract

The four-year contract calls for three principal exporting countries, Canada, the United States of America, and Australia, with small contributions from France and Uruguay, collectively to supply 456 million bushels of wheat a year to the importing countries—not an impossible task, as that quantity represents by no means the whole of the normal exports of those countries. The maximum price is fixed at 1 dollar 80 cents a bushel. For their part, the importing countries undertake to buy 456 million bushels each crop year from the exporting countries if the latter desire a market for that quantity. The minimum price will be 1½ dollars a bushel for 1949-50, dropping progressively to 1 dollar 20 cents in 1952-53. "Wheat" includes flour expressed in terms of wheat.

The terms of the pact provide that negotiations shall take place freely within the determined price limit. The decision about the manner in which trading is conducted will lie with the individual Governments, as long as their obligations under the pact are carried out. Provided that the free movement of prices within the framework of the agreement is maintained, complete liberty of action in national agricultural price policies is retained by the signatories. The agreement does not, of course, cover all the wheat which will be moving in international trade during the next four years, but it is hoped that the stabilisation of the price for this hard core of 456 million bushels a year will exert a steadying influence on prices for the remainder of the wheat bought and sold in the world's markets.

## May be Forerunner of Other Agreements

In effect, then, the exporting countries, in return for selling 456 million bushels of wheat a year for four years at prices not higher than 1 dollar 80 cents a bushel, have secured international minimum-price protection for their producers for the same period, and the importing countries, in return for guaranteeing a market for 456 million bushels at prices not lower than the minima specified, have ensured security of supply—a major development toward world economic co-operation. This may be the forerunner of other international commodity agreements, in which New Zealand, as a competitor on the world's markets for most types of primary produce, must be vitally interested.

Australia is New Zealand's major supplier of wheat, and prices for Australian grain, which vary with freight rates and other factors, will be determined periodically by the executive committee of the International Wheat Council, which is set up under the terms of the agreement. Under present conditions, the equivalent in New Zealand currency of the maximum price for Australian wheat of fair average quality has been estimated at 12s. 10½d. a bushel and the minimum for the first year at 11s. 4d., falling to about 9s. 2½d. in the final year.

## New Zealand's Share

New Zealand has been allotted 4,600,000 bushels a year from the export pool, but, though that quantity may appear generous, it does not mean that any slackening in the Dominion's drive for greater cereal production can be permitted—quite the contrary. The country's annual requirement is estimated at 12 million bushels and, apart from needs for human consumption, supplies must be maintained for our poultry industry if we are not to suffer an ever-recurring shortage of eggs. Even with the stimulus of war conditions the largest crop grown in the Dominion for many years was 9,800,000 bushels in 1942-43, and by 1947-48 it had fallen to less than 4½ million bushels. That figure would leave a gap of some 7½ million bushels to fulfil our needs, and even after receiving our quota under the international agreement New Zealand would still have to seek about 3 million bushels on the open market at prices which cannot be predicted.

EDWARD CULLEN, Minister of Agriculture.

# CARE OF LIVESTOCK DURING DECEMBER

Contributed by the Animal Research Division.

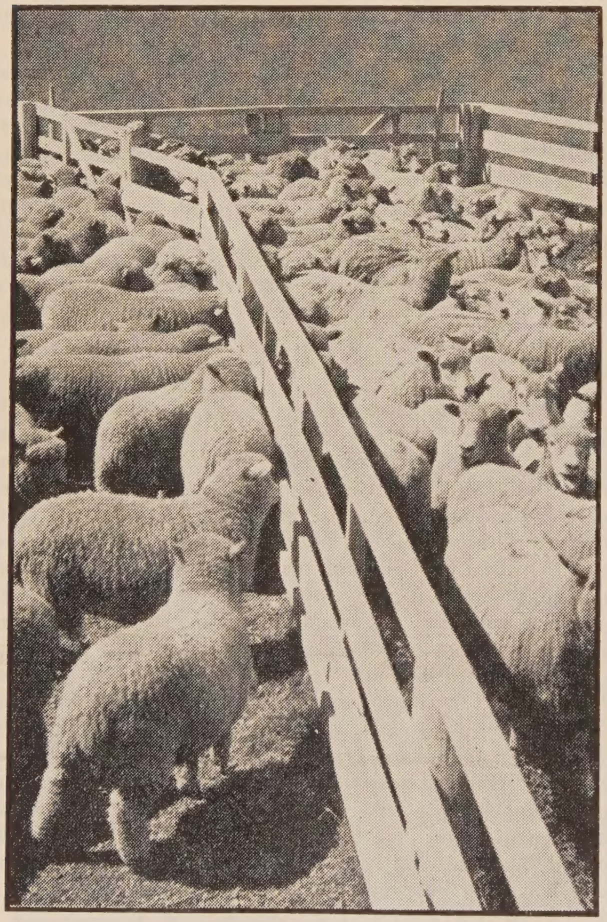
### DAIRY COW NUTRITION

THE year's production can be materially affected by feed conditions during summer. Cows fed poorly now not only produce less milk during summer, but will dry off earlier in autumn. Dairy statistics show that long lactation is very important, so start feeding silage or other supplementary milk-producing fodders as soon as pasture begins to dry off. Do not wait for milk production to show a material fall.

* * *

### CARE OF EWES AND FAT LAMBS

As each lot of lambs is sold draft off their mothers together with any dry ewes which may remain in the flock. If feed is short and the ewes have very little milk, it usually pays to wean all the lambs, which can then be given the best grazing available. The ewes should be shorn and those which are to be retained should be placed on short pasture with ample water. This will help to reduce their condition and will result in a better lambing percentage next season.



### SHEARING

If ewes with lambs are to be shorn, every effort must be made to reduce the time during which lambs are away from the ewes, as it is easy to dry off ewes at this time of the year. They should be brought to the shed in small mobs and should be dagged before reaching the board.

* * *

### FOOT-ROT CAN BE ERADICATED

Farmers who wish to eradicate foot-rot from their flocks should read the Department of Agriculture's Bulletin No. 325. This is the season in which the eradication campaign must be planned.

* * *

### PIG FEEDING

Sows should be brought into the house a week or two before farrowing and fed up to 6 gallons of milk per day, but this should be reduced to 2 gallons plus bran, if available, on the due date. Watch for signs of constipation in heavy, in-pig sows. Baconers from spring litters should be sold as sow feed requirements increase, as it is important not to starve the sows and litters. These sows require 6 gallons of milk plus an additional gallon for each pig in the litter. Meal may replace part of this ration at the rate of 1lb. of meal for every gallon of milk. Orders for meal supplies for next spring should now be placed with the merchants.

* * *

### COWS RETURNING TO THE BULL

If cows are returning to service, examine the mating records to see if any particular bull is to blame. If so, get a Veterinarian or Stock Inspector to collect a semen sample for examination. Be careful in purchasing replacement bulls. If possible, buy a young bull that has not been used previously. Never buy a bull in the saleyard unless his full history is known. Washing out cows seldom helps and may cause trouble if irritant fluids such as kerosene are used. It often pays to consult a Veterinarian as soon as the cows are noticed returning to service in unusual numbers. He cannot be expected to diagnose the trouble months later.

* * *

### FOWL POX

So-called roup is often fowl pox. Send specimens to the Animal Research Station, Wallaceville, for diagnosis. Outbreaks of this disease can be prevented by vaccination, full details of which may be obtained from the nearest Poultry Instructor of the Department of Agriculture.

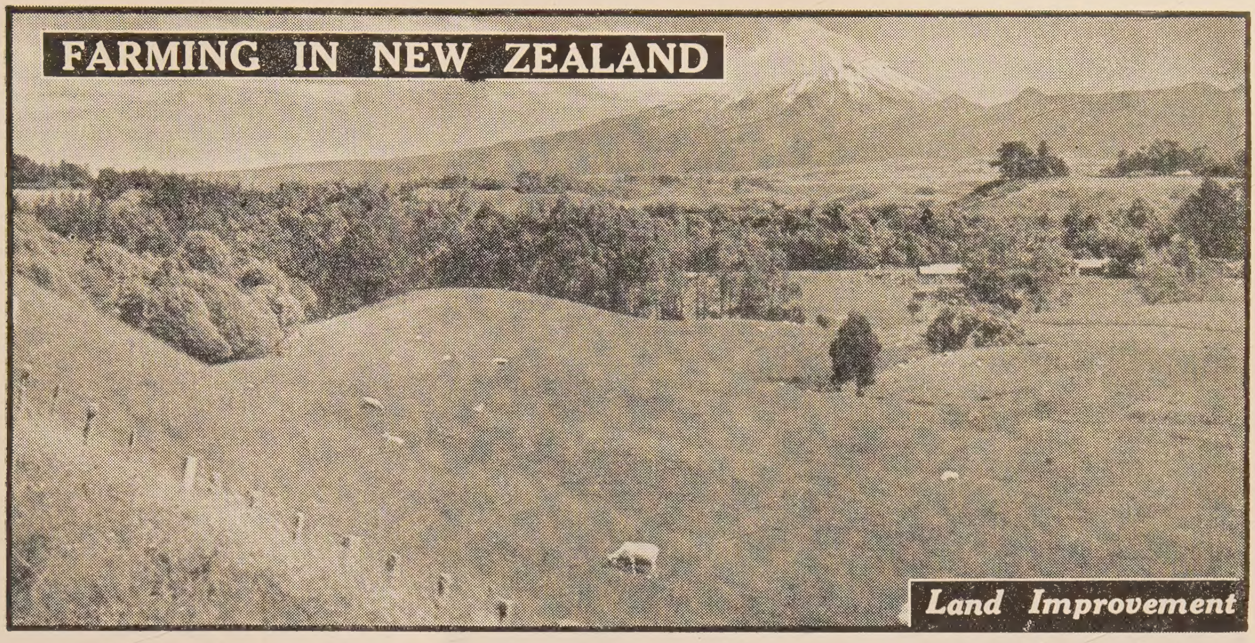
* * *

### ZINC POISONING IN PIGS

The zinc lining of new galvanised pipes may be dissolved by dairy by-products flowing through them and the by-products then prove poisonous when fed to pigs. Consult the nearest Veterinarian before making a new installation.

# FARMING IN NEW ZEALAND

## Land Improvement



**THE pastoral industries of New Zealand have been asked to accept the task of endeavouring to produce an extra 50,000 tons of meat and 30,000 tons of butterfat within 7 years. This can be achieved only if most existing farms are made more productive through land improvement and more efficient livestock management. This article by P. W. Smallfield, Director of the Extension Division, Department of Agriculture, Wellington, is the first of four dealing with proved land-improvement practices, some of which, if more widely adopted, will help to fulfil the immediate task of increasing food production, while others are concerned more with the long-term improvement of farming. These articles will deal with land classification and the general fertility-building and conservation methods appropriate to each class and with some of the more important variations imposed by certain soil types within each major land class.**

NEW ZEALAND'S first duty should be the preservation and improvement of the fertility of the land. Apart from labour, the land is the country's only real asset and must be the basis of its future well-being and wealth.

The land of New Zealand has been farmed for just over 100 years, during which time fertility has been improved over little more than a tenth of the land and not a great deal has been done to mitigate fertility depletion on the remainder. Early farm practices conformed to the demands of nineteenth-century industrialism for cheap food and raw materials—demands which despoiled large areas of the virgin lands of the New World and caused the growth in the Old World of vast congregations of people unable to provide their own sustenance. In common with those in other new countries New Zealand settlers burnt and over-grazed natural pastures, exploited the stored fertility of forest lands, and started on the path of improvement only when forced to take in hand land of such low natural fertility that soil-fertility building was necessary before the land could be farmed. From the latter lands grew the practices of intensive grassland farming which are the basis of the country's present prosperity—practices which the Dominion must aim to adopt for the improvement of a much wider area of land so that the fertility and production of the major part of the pastoral areas may be improved progressively.

The task of land improvement is not easy, and it is a collective as well as an individual responsibility. If the task of the individual land improver is hard, his reward is great, for what satisfaction can compare with the satisfaction of land improvement (quite apart from the profit which normally accrues from such work)? To the nation the collective responsibility and the rewards are just as great, for no nation that does not sustain the productivity of its land can long endure.

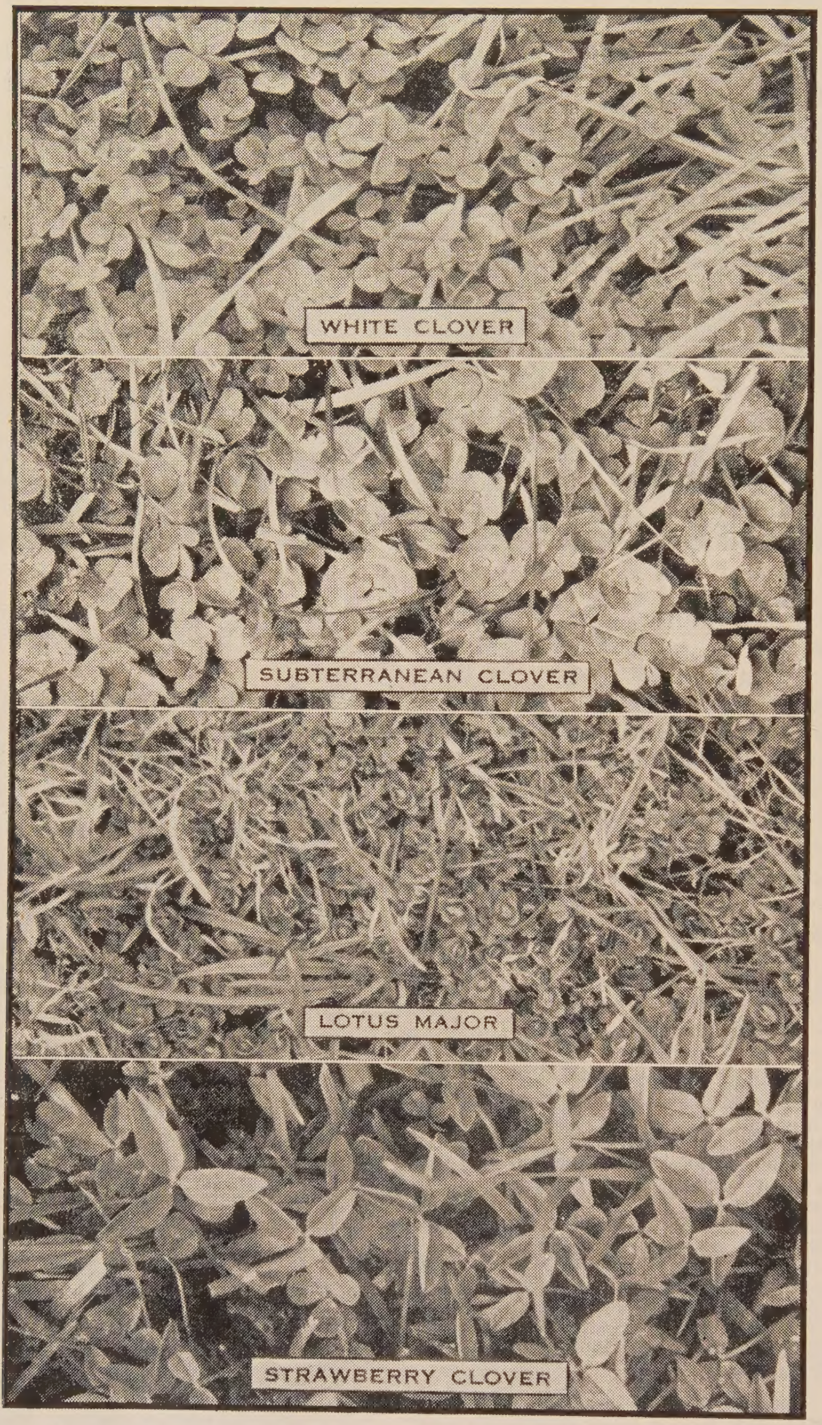
### Land and Wealth

"Wealth," says the economist, "consists of all potentially-exchangeable means of satisfying human needs." New Zealand obtains its wealth and well-being by exchanging the products of the land chiefly for the products of industrial Britain, and the exchange is generally approved on the grounds that each country concentrates on a low cost of production. However, New Zealanders may ask themselves: "Are our costs really low or are we exchanging our land (our capital) rather than the products of the land?" If soil fertility is not being maintained or improved, whence will come the wealth necessary for the well-being of a greatly-increased population?—such a population as may be necessary to maintain the security of the country.

The history of man's domination of the land shows far more instances of destruction of soil fertility than of improvement or even of maintenance. His destruction of the natural plant covering (which under Nature normally has given back to the soil as much as it has taken from it) has generally resulted in fertility depletion, and unless this path is changed the world in future will not be able to feed its peoples, for there are now no New Worlds to exploit.

**From areas where man has succeeded in maintaining or improving fertility certain lessons may be learned, and the lessons are that methods of land improvement and soil-fertility building must be such as can be carried out by the occupiers of the land and will be of tangible benefit to them.**

# LEGUMES AND FERTILITY



Land improvement depends largely on the use and improvement of the growth of legumes. White clover is the fertility builder on pastoral land which does not suffer unduly from summer dryness; on land which is unduly dry in summer subterranean clover takes its place. *Lotus major* is useful on moist land in the warmer districts where the soil phosphate level is below that required for white clover. Strawberry clover has its place on rich moist land (particularly reclaimed saline flats) which is too moist for white clover.

**Works imposed by authority of Acts of Parliament or fostered by subsidies are not as likely to succeed as those arising spontaneously from the occupiers or induced from a sense of gaining ultimate well-being for themselves and their country. Coercion, where it may be necessary, should be a social sanction imposed by the decision of local communities.**

The occupiers of the land are the only people who can maintain or improve soil fertility, and they will embark on improvement practices if results are tangible. If the results of their first efforts are successful, other practices or works which may be necessary for soil conservation are likely to be undertaken, perhaps not so much for further tangible benefits as for the protection of the improved asset given by the primary works.

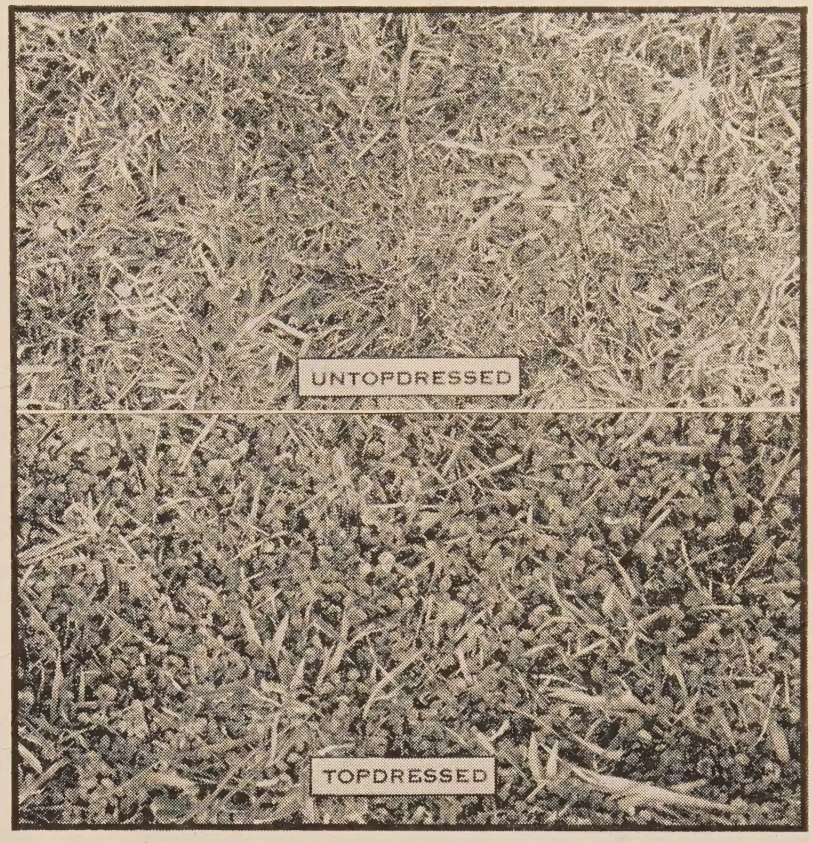
## Soil Fertility

Composition and situation are the factors determining the natural fertility of soils, and each is capable of infinite variety. Parent rock and method of formation, rainfall and temperature, age and slope, vegetation and animals all contribute to natural fertility which Man may exploit, conserve, or improve through the management methods he adopts. Thus, though the fertility factors concerned in even one soil are of infinite complexity, the general farming practices which exploit, conserve, or improve fertility are capable of fairly precise definition.

Apart from the modern application of fertilisers and the ages-old use of animal manures and lime, fertility maintenance in the history of farming has really rested on two major practices—the fallow and the use of legumes. The use of both is very old, for Pliny commenting on Virgil noted " . . . that alternate fallows should be made and that the land should rest entirely every second year. And this is indeed both true and profitable provided a man have land enough to give the soil repose. But how if his extent be not sufficient? Let him sow next year's wheat on the field where he has just gathered his beans, vetches, or lupins or such other crop as enriches the land. For it is indeed worth notice that some crops are sown for no other purpose but as food for others, a poor practice in my estimation." The real advancement in recent years has been the development of fertility-building and highly-productive pastures containing clovers and allied plants through the use of fertiliser and lime. Mixed pastures of grasses and clovers have lessened the necessity for annual legume crops for soil-fertility maintenance.

Wherever people are few and land abundant men rely on the fertility of virgin soils; they take natural pastures, forest, or scrub land, graze or burn and cultivate the land until it shows signs of exhaustion, and then move on, allowing the land to regenerate grass, forest, or scrub. Nomadic peoples, ancient and modern, primitive and highly civilised, have followed this method. The nineteenth- and twentieth-century practices in the New World were possibly more destructive of fertility than those of primitive nomads, for both cropping and grazing were more intense and sustained.

## BENEFITS OF TOPDRESSING



Experience has proved that in the higher-rainfall areas topdressing accompanied by the oversowing of clovers will improve the carrying capacity and fattening qualities of large areas of surface-sown grassland.

Settled communities have had to devise methods which maintain fertility. The basis of medieval European farming was the restorative fallow (the summer fallow for nitrogen, the winter fallow for potash and phosphates), assisted by hardly-adequate supplies of dung. Backed by sanctions of custom and local authority, the general adherence to a rigid system of crop, pasture, and livestock management did produce a constant but low level of fertility maintenance on arable land throughout the Middle Ages.

The next stage (exemplified particularly in British farming) was the development of modern mixed farming in the eighteenth, nineteenth, and twentieth centuries. Fertility was raised through the inclusion of clovers and turnips in crop rotations, the introduction of fertilisers, and the intimate combination of livestock and crop production. With security of land tenure and freedom of action no sanctions were necessary to enable occupiers to improve land. Each new practice gave tangible results: Improved rotations and fertilisers gave higher crop yields, heavier crops enabled more livestock to be reared and fattened, and the increased number of livestock produced larger quantities of manure, which benefited succeeding crops. Crop and livestock production were increased and farming was made more profitable.

However, these advances did not cover the real scope of land-fertility maintenance, for even at present most highly-developed mixed-farming areas draw on the fertility of extensive pastoral areas where the livestock for fattening are bred and reared. No community can flourish indefinitely on a fixed area of land unless fertility maintenance is reasonably complete on all areas devoted to the production of food. The exhaustion of extensive pastoral areas for the benefit of arable and intensive pastoral areas must in the end contract production.

The extensive pastoral areas of the New World now contribute largely to the meat (through the rearing of store and breeding stock) and wool supplies of the crowded dependent populations of industry, and these pastures in general are not increasing in productivity. The extensive grazier, commonly merely leasing natural grassland, has done little or nothing to increase fertility; rather the general experience has been that he has repeatedly burnt and over-grazed and depleted fertility. This depletion of fertility usually has not been deliberate, but has been forced by economic conditions. Many of the normal methods suggested or enforced for conservation—for example, spelling and cessation of burning—give no immediate tangible results and have to be enforced by coercion.

Commonwealth countries have a fairly common story of depletion and erosion of soils. "In Canada there was evidence of a general decline in soil fertility. Yields were falling, trace-element deficiency diseases were increasing; the present widespread tendency to soil drifting had not been foreseen when the land was first cultivated. . . . In Australia . . . much depletion of soil fertility had resulted from over-cultivation and over-grazing. . . . The increase in population in India was producing a very serious situation with regard to depletion of soil resources. Nobody had a clear picture of how much damage had been done by erosion. . . . South Africa was mainly pastoral and most of the pastures were natural. It was essential to discover conservative systems of intensive farming. Legislation had been enacted putting the responsibility for proper land use on the farmers. The State assisted with subsidies and only intervened by expropriating the land in the last resort. . . . In parts of Kenya large areas of fertile forest land had reverted to desert conditions within living memory. . . . " (1)

In New Zealand settlers burnt and over-grazed (or allowed rabbits to over-graze) the natural pastures, exploited the fertility of the forest lands, and started on the path of fertility building only when it was necessary to take in hand land of low virgin fertility, and the practice of topdressing grassland was developed. Topdressing is one of those practices that adequately fills the requirements for land improvement: It can be done by the occupiers of the land; it gives immediate tangible results; its development requires no coercion; and from it flow other desirable farm practices and improvements.

So far topdressing has been confined mainly to 4 to 5 million acres of flat and undulating land, and this land has provided the great increase in supplies of meat, wool, and dairy produce in the past 25 years. Very little has been done to mitigate the depletion of fertility on the 10 million acres of surface-sown grassland and 13 million acres of native tussock grassland. Experience has proved that in the higher-rainfall areas topdressing accompanied by the oversowing of clovers will improve the carrying capacity and fattening ability of large areas of surface-sown grassland. On such areas topdressing obviously should be the primary step in fertility building and conservation. From it will flow other necessary conservation methods in the control of erosion, but without the primary practice to give tangible results the secondary practices will be undertaken only with the aid of heavy subsidies and coercion. For the 13 million acres of native pasture the best that can be hoped for at the moment is conservation through rabbit destruction, regulated grazing and burning, and spelling. None of these will start the upward spiral of fertility building and they can secure only conservation. The path to improvement may be found later in suitable pasture species which will conserve or increase fertility and offer increased carrying capacity as the reward for their introduction.

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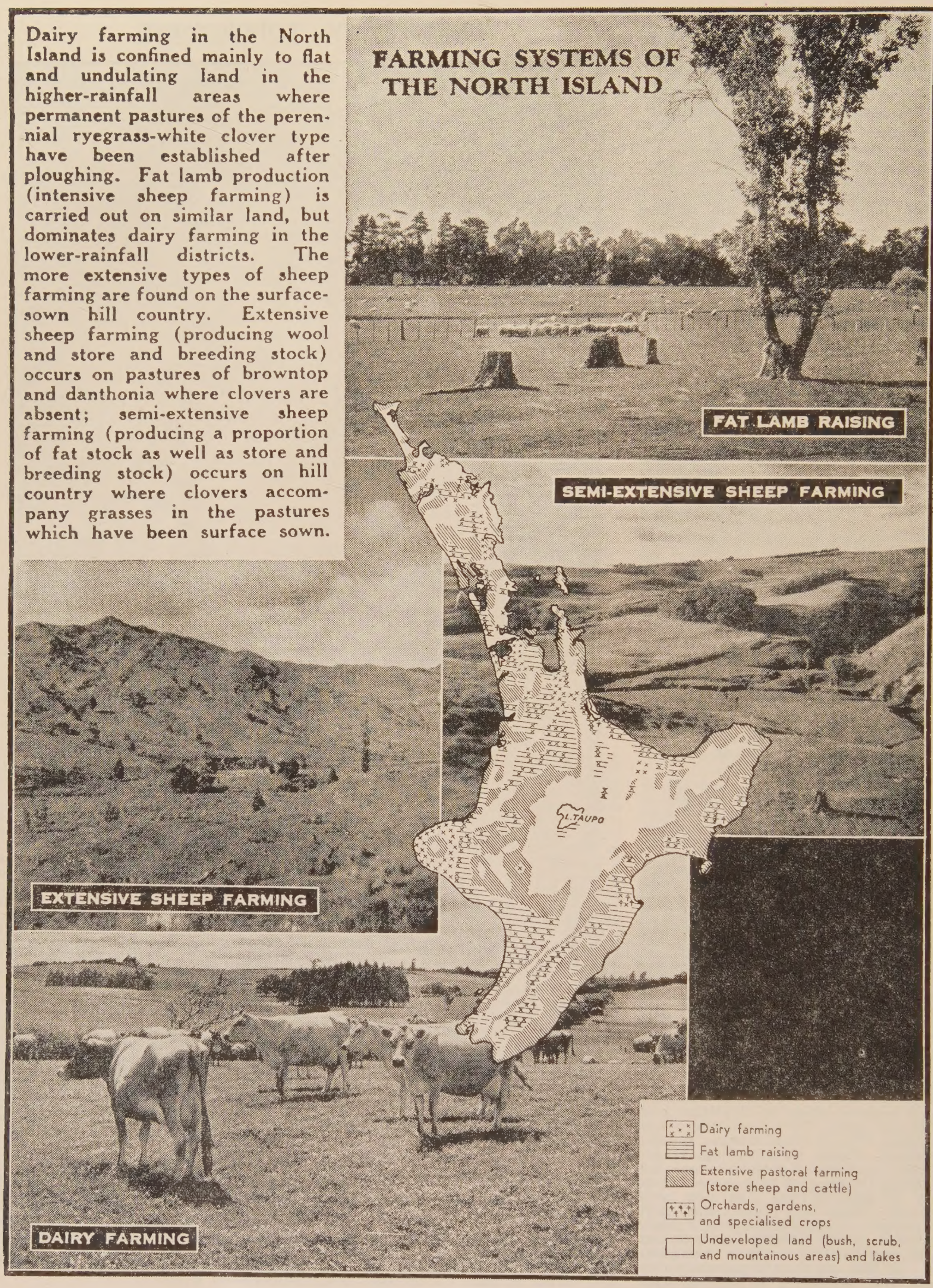
1. From a summary of discussions on problems of land utilisation and conservation, the Royal Society Empire Scientific Conference, 1946, Volume II, pages 217 and 218.

# FARMING SYSTEMS OF THE NORTH ISLAND

Dairy farming in the North Island is confined mainly to flat and undulating land in the higher-rainfall areas where permanent pastures of the perennial ryegrass-white clover type have been established after ploughing. Fat lamb production (intensive sheep farming) is carried out on similar land, but dominates dairy farming in the lower-rainfall districts. The more extensive types of sheep farming are found on the surface-sown hill country. Extensive sheep farming (producing wool and store and breeding stock) occurs on pastures of browntop and danthonia where clovers are absent; semi-extensive sheep farming (producing a proportion of fat stock as well as store and breeding stock) occurs on hill country where clovers accompany grasses in the pastures which have been surface sown.


FAT LAMB RAISING
SEMI-EXTENSIVE SHEEP FARMING
EXTENSIVE SHEEP FARMING
DAIRY FARMING
L. TAUPO
Dairy farming
Fat lamb raising
Extensive pastoral farming (store sheep and cattle)
Orchards, gardens, and specialised crops
Undeveloped land (bush, scrub, and mountainous areas) and lakes

In the past the increase in population in New Zealand has followed fairly closely increased primary production, and if for security or other reasons the development of a population two or three times as great as at present is desired, it is only logical to assume that the volume of primary production must be increased in similar proportions.

At present about 30 per cent. of total meat production, 20 per cent. of butter production, and 5 per cent. of cheese production are consumed in the country, and half the wheat requirement is imported. With three times the present population only a small volume of food exports would be available to exchange for necessary imports unless the production of primary products kept pace with the increased population.

**There is no doubt that the Dominion's lands are capable of giving ultimately twice the present flow of food, fibre, and forest products, provided fertility building is widened to embrace gradually all the potentially-productive lands in the Dominion.**

## Land Under Occupation

New Zealand is a pastoral country. Of the 43 million acres under occupation, about 31¾ million acres consist of pasture lands of various types and only a little more than 1 million acres grow annual crops, of which about half are cereals and half fodder crops. The detailed classification of occupied land as at January 31, 1947, given in the following table excludes areas within cities and boroughs and holdings smaller than 1 acre:—

**LAND UNDER OCCUPATION, 1946-47**
**(thousands of acres)**

| | |
|---|---:|
| Sown pastures | 18,077 |
| Tussock grassland | 13,827 |
| Annual crops | 921 |
| Fallow land | 124 |
| Orchards and gardens | 113 |
| Plantations | 870 |
| *Phormium tenax* | 34 |
| Fern, scrub, and forest | 7,425 |
| Barren and unproductive | 1,709 |
| Total area occupied | 43,100 |

Sown pastures consist of land sown to grass after being ploughed or after being surface sown following the burning of natural forest, fern, or scrub. Though no recent data are available of the areas sown by each method surface-sown pastures probably cover 10 million acres and pastures on cultivated land 8 million acres.

The pastures sown after ploughing are used chiefly for meat and milk production and are on flat and undulating land. In the higher-rainfall districts the pastures are permanent or long rotation and in the lower-rainfall areas short rotation. A feature of these pastures is that the swards generally consist of a mixture of grasses and clovers, and the clovers are essentially the fertility-building constituent. Where ploughable lands in the higher-rainfall areas are not naturally fertile enough to grow clovers the custom has been to topdress with fertilisers, lime, or both to raise the fertility to clover level, thus providing for the subsequent rewards of clover fertility in increased carrying capacity.

The surface-sown pastures, on the other hand, are generally deficient in clovers and most of the area is devoted to the production of wool and of store and breeding stock which are transferred to the flat and undulating lands for meat production. However, where the land is naturally fertile or has increased in fertility through being topdressed the pastures consist of a mixture of grasses and annual or perennial clovers and fat as well as store stock are produced from them. Situated generally on steep and hilly land, these surface-sown pasture lands have suffered from sheet and slip erosion over fairly large areas, and gully erosion is a problem on certain restricted areas. In the high-rainfall areas the tendency for the land to revert to secondary growth is strong, and a constant struggle must be maintained to suppress it by grazing management, cutting and burning, and resowing to grass.

The pastures of tussock and other native grasses are on the hilly and mountainous country in the lower-rainfall areas east of the main divide in the South Island and are used for extensive pastoral farming. These pastures evolved in the absence of grazing animals and in the natural state were not particularly palatable to sheep. However, the grazier found that the fresh growth which followed the burning of the tussocks was eaten readily by sheep, and in the earlier years of settlement indiscriminate burning, overstocking, and the destruction of plant cover by rabbits led to serious deterioration and in places to depletion of vegetation. The development of methods for the improvement of the plant cover and regeneration of the native tussock remains a major problem.

The production of field crops is restricted mainly to the flat and undulating land in the lower-rainfall and colder districts where summer or winter fodder crops or both are required to supplement pastures for livestock feeding. The common crop rotations include cereal, pulse, fibre, food, and seed crops, as well as summer and winter fodders. After 2 or 3 years in crop the land is sown to pasture, which may remain down for 3 to 5 years, or longer on heavier soils or in higher-rainfall areas, and while under grass the land regains the fertility lost during the period under crop.

## Systems of Farming

The 18 million acres of sown grass, 13¾ million acres of tussock grassland, and ½ million acres of root and green fodder crops support nearly 1¾ million dairy cows in milk and 3 million other cattle as well as 20¾ million breeding ewes. Systems of farming conform to the productivity of the pasture lands and comprise the following types:—

There are, of course, farms which combine more than one type of management. Dairying may be combined with sheep farming, and on a sheep farm intensive pastoral farming may be practised on one section and extensive farming on another.

The general locations of each type are given in the maps on the opposite and following pages. Very extensive sheep farming is carried out on the high mountainous tussock grassland of the South Island and extensive pastoral farming on the lower tussock grassland areas and over the major part of the surface-sown grasslands of the North Island. As pastures improve, fat as well as store and breeding stock are produced, but really-intensive grassland farming is confined mainly to the flat and gently-undulating country. The term arable mixed farming is commonly used where intensive pastoral farming is combined with the production of cash crops.

The sheep farmer usually grazes cattle as well as sheep, particularly on the sown grasslands of the North Island, for cattle are necessary to maintain pastures in a suitable condition for sheep. Surplus summer growth must be eaten down in autumn to keep pastures suitable for sheep, and on hill country cattle are necessary to crush fern and other secondary growth.

The different types of sheep farming are closely integrated: The extensive sheep farmer supplies the breeding ewes, store lambs and wethers, and store cattle to the intensive grazier. The trend during recent decades has been toward a marked improvement in carrying capacity on the intensively-farmed areas and a stationary or declining carrying capacity on the extensively-farmed areas. This tendency is so marked in certain areas that intensive pastoralists have had to turn to breeding at least part of their replacement stock.

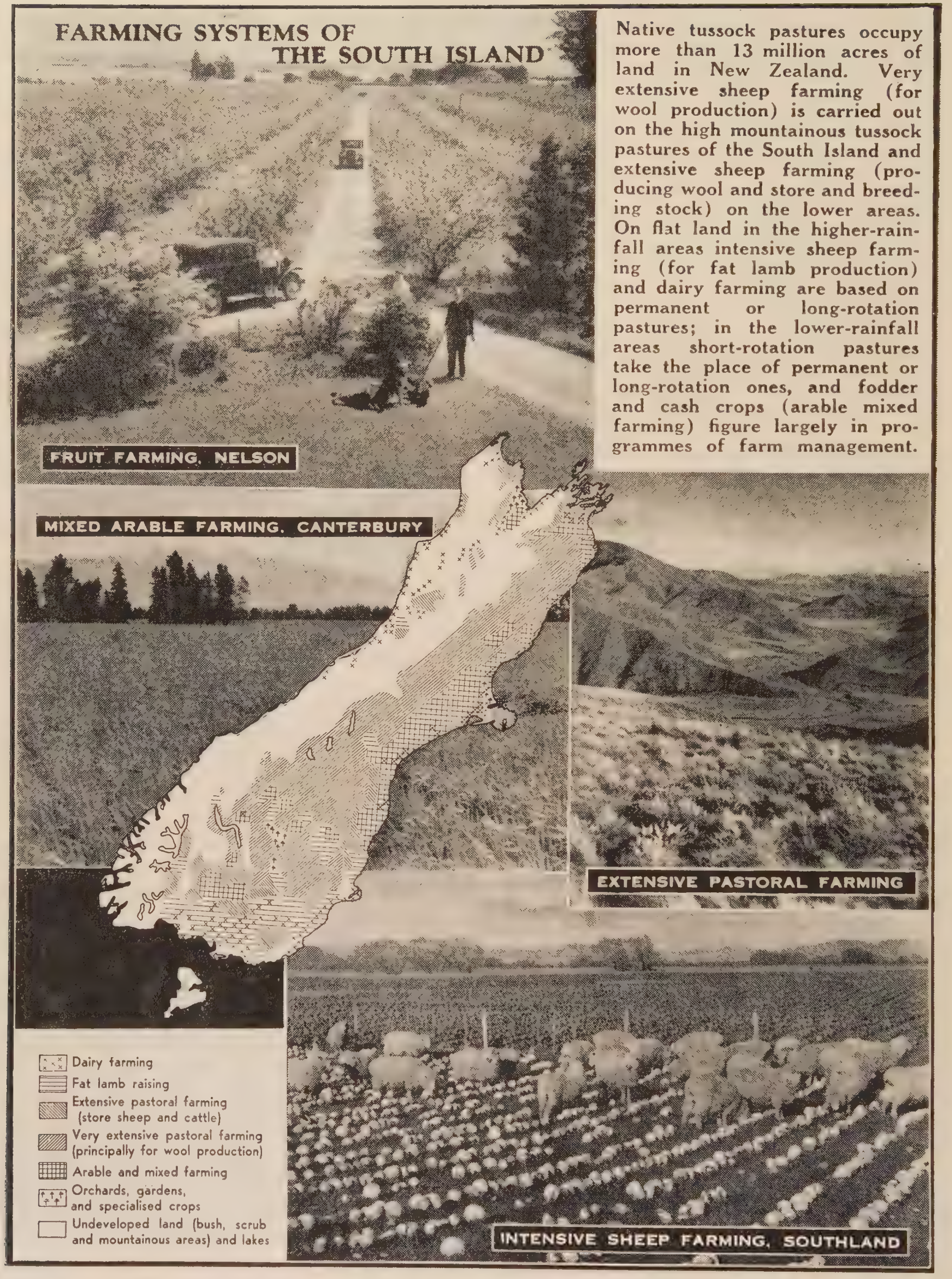
## Land Classification

A discussion of methods of land improvement is facilitated if land is first classified. Unfortunately, there is no general uniformity in methods of classification because of the diversity of emphasis which classifiers have placed on the physical, social, and economic factors involved in the definition of land classes. For the land improver the most useful classification is one based on the plants which the soil will produce and which may be converted into marketable products. In New Zealand pasture plants are a useful index of fertility and intensity of farming, and of pasture plants clovers are possibly a better index than grasses. The pastoral lands of

| Type of Farming | Products |
|---|---|
| Very extensive sheep farming | Wool |
| Extensive sheep farming | Wool and store and breeding stock |
| Semi-extensive sheep farming | Wool and store and breeding stock, plus a proportion of fat stock |
| Semi-intensive sheep farming | Wool and fat stock with a proportion of store and breeding stock |
| Intensive sheep farming<br>(a) Permanent grass<br>(b) Grass and fodder crops<br>(c) Grass and fodder and cash crops | Wool and fat stock |
| Dairy Farming | Whole milk, cream, pig meat, and store and fat cattle |

# FARMING SYSTEMS OF THE SOUTH ISLAND

Native tussock pastures occupy more than 13 million acres of land in New Zealand. Very extensive sheep farming (for wool production) is carried out on the high mountainous tussock pastures of the South Island and extensive sheep farming (producing wool and store and breeding stock) on the lower areas. On flat land in the higher-rainfall areas intensive sheep farming (for fat lamb production) and dairy farming are based on permanent or long-rotation pastures; in the lower-rainfall areas short-rotation pastures take the place of permanent or long-rotation ones, and fodder and cash crops (arable mixed farming) figure largely in programmes of farm management.



FRUIT FARMING, NELSON

MIXED ARABLE FARMING, CANTERBURY

EXTENSIVE PASTORAL FARMING

INTENSIVE SHEEP FARMING, SOUTHLAND

× Dairy farming
☰ Fat lamb raising
▨ Extensive pastoral farming (store sheep and cattle)
▨ Very extensive pastoral farming (principally for wool production)
▦ Arable and mixed farming
↑ Orchards, gardens, and specialised crops
☐ Undeveloped land (bush, scrub and mountainous areas) and lakes

New Zealand may be divided broadly into the classes set out in the table on this page, depending on the use to which they are put, certain pasture plants they support, and the topography of the land. (2)

Clovers have been used as the basis of classification, for land improvement depends mainly on using and improving the growth of legumes. Though advancement in the science and practice of farming has provided the means of doing this on an ever-increasing variety of soils, the replacement of legumes with cheap synthetic nitrogenous fertilisers has not yet been found practicable, though that may be the next stage in advancing pasture production beyond that at present attainable with a combined sward of grasses and clovers.

Each of the land classes outlined is composed of numerous soil types, and each soil may require some modification to be introduced to a general land improvement method applicable to the land class. Topdressing with fertilisers and lime is a general land-improvement practice, but soils differ in their need for phosphates, potash, lime, etc., and the details of the practice must be made to suit soil requirements.

**The main soil types in New Zealand have been named and mapped and their natural fertility level studied, and land improvers should discuss their plans with local instructors of the Extension Division of the Department of Agriculture, who are in a position to advise on details of soil and land treatment.**

## CLASSIFICATION OF PASTORAL LANDS

| USE | CHIEF PASTURE CHARACTERISTIC | TOPOGRAPHY |
|---|---|---|
| Meat and milk | 1. Water grasses | Flat; subject to periodical flooding |
| | 2. Strawberry clover | Flat; reclaimed tidal |
| | 3. White clover permanent | Flat and undulating |
| | 4. White clover permanent when land is topdressed and/or irrigated or drained | Flat and undulating |
| Meat | 5. White clover permanent, but not vigorous | Hilly and steep |
| | 6. White clover permanent only if topdressed, and improvement work more costly than on 4 because of topography (a) or special soil condition (b) | (a) Elevated, flat and rolling, or hilly and steep; (b) flat and rolling |
| | 7. White clover lasts only 3 to 5 years with or without topdressing | |
| | (a) Subterranean clover with topdressing | Hilly and steep |
| | (b) Low yields of annual crops and subterranean clover more suitable than white clover | Flat and rolling |
| | (c) Medium yields of annual crops | Flat and rolling |
| | (d) High yields of annual crops | Flat and rolling |
| Meat, store stock, and wool | 8. Annual grasses and clovers | Flat |
| Store stock and wool | 9. Clovers absent and topdressing not feasible | |
| | (a) Danthonia-browntop | Hilly and steep |
| | (i) With no erosion | |
| | (ii) With erosion | |
| | (b) Native pastures | Hilly and steep |
| | (i) With no erosion | |
| | (ii) With erosion | |
| Wool | 10. Native pastures | Mountainous |

### Class 1: Land Subject to Periodical Flooding (Water Grasses)

The land improver should be careful to assess the value of the pastures which land subject to periodical flooding will produce naturally against the changes in vegetation which may occur if the incidence of flooding is altered. Many attempted improvement works on such land have resulted in making conditions unsuitable for water grasses and still not suitable for moist- or dry-land pastures. Attempts to change natural ponding areas from floating sweetgrass to perennial ryegrass and white clover may result in a waste of tall fescue or manuka if the drainage or stopbanking works are inadequate—that is if, though winter flooding is prevented, the drainage outfall is not sufficient to reduce the water level in the soil.

Land subject to periodical flooding is present in the lower reaches of rivers and streams of all sizes. Large areas of such land exist in the lower Waikato and Manawatu, but the average farmer is concerned mainly with small areas in stream valleys, in which flooding may vary from periodical floods of short duration to total submergence for 4 or 5 months. Conditions are too wet for clovers, but soils comprising this class of land are naturally rich in organic matter and with a high summer water-table are capable of providing abundant summer grazing from water grasses. The

Class 1: Land subject to periodical flooding (water grasses). Pastures of *Paspalum distichum* near Mercer.

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2. "Land Classification in New Zealand," a paper by L. I. Grange and P. W. Smallfield delivered to the Seventh Pacific Science Congress.

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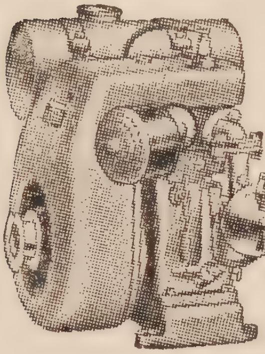

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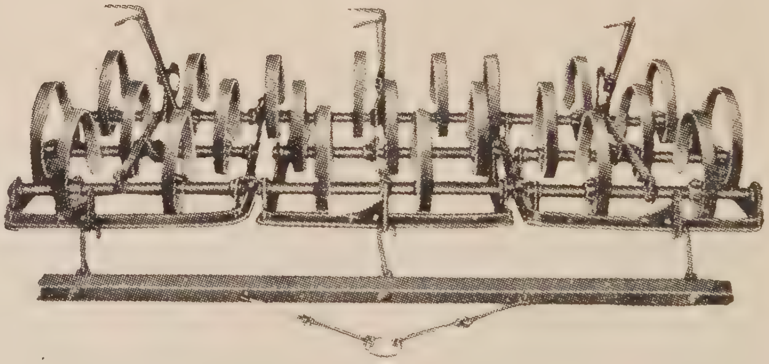

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Class 2: Wet or saline land (strawberry clover). Tidal flats being reclaimed in North Auckland.

common species of water grasses used are reed sweetgrass (*Glyceria aquatica*), floating sweetgrass (*Glyceria fluitans*), mercer grass (*Paspalum distichum*), and reed canary grass (*Phalaris arundinacea*) where winter flooding is prolonged. On areas where winter flooding is not so prolonged meadow foxtail (*Alopecurus pratensis*), rough meadow grass (*Poa trivialis*), Yorkshire fog (*Holcus lanatus*), and paspalum (*Paspalum dilatatum*) are frequently associated with the former grasses.

Each grass has its own particular requirements. Mercer grass and paspalum are confined mainly to the warmer areas in the Auckland Land Districts. Floating sweetgrass grows in areas where the flood waters keep moving gently, and reed sweetgrass thrives where the flood waters are more or less stagnant.

Mercer grass grows most abundantly in the flooded areas of the lower Waikato, where it survives several months of complete immersion. The grass is extremely palatable, but as it is a shy seeder it must be propagated by cuttings. The grass is cut by frosts and survives only when winter floods give a complete cover to the plants.

*Paspalum dilatatum* will stand complete immersion for only relatively-short periods and is really a dry-land rather than a water grass. Floating sweetgrass also will not stand as severe flooding as mercer grass or reed sweetgrass; it thrives particularly when the water is moving and the flooding not so severe as to prevent the plant's long, trailing stems reaching the surface of the water. Over wide areas of winter-flooded land reed sweetgrass is quite suitable; it is not as palatable as mercer grass or floating sweetgrass, but produces a great bulk of summer fodder which is eaten readily. All these water grasses will grow in drains, and in certain situations may cause considerable interference with the free flow of drainage water.

**There is little doubt that utilisation of flooded areas with water grasses is frequently more economical than improvement through costly stop-banking and drainage and pumping works, particularly where the flooded area is merely a portion of a dry-land farm and through the introduction of water grasses can be made to produce valuable summer feed at slight expense.**

### Class 2: Wet or Saline Land (Strawberry Clover)

Strawberry clover (*Trifolium fragiferum*) is a most valuable clover on land which is too wet or too saline for white clover and is used most advantageously in the reclamation of the tidal estuary lands of rivers and harbours.

The reclamation of tidal land is a long-term project and requires the erection of fairly costly works, consisting of stop-banks, floodgates, drains, and frequently pumping plants, but the land usually is highly productive when grassed, and more tidal reclamation works could add many thousands of acres of useful grassland to the pastoral area of the Dominion.

In the reclamation of a tidal flat stop-banks must be erected and are raised from material obtained from a ditch which runs parallel to and on the inside of the stop-bank and which ultimately serves as the main drainage canal for the reclaimed area. The material for the ditch is moved forward a few feet and built into a bank, the height of which depends on the maximum rise and fall of the tide but should be at least 2 or 3ft. higher than the level of maximum tides. The stop-bank may require revetting with stones or brush to prevent wave erosion in exposed positions and should be planted with earth-binding grasses. In the northern districts buffalo grass and kikuyu grass are very suitable for this purpose. Drainage outlets through the stop-banks must be provided by flood-gates with concrete or timbered supports or by concrete pipes. The rapid removal of drainage water is greatly facilitated if flood pumps are installed to lift water away between tides.

After the tidal waters have been excluded from the area the next step is to provide adequate internal drainage by open and covered drains so that the rain may wash through the soil and carry away the surplus salt. Three to 10 years may pass before reclaimed tidal land is fit for grassing. The first indication that the salt content is being lowered is the appearance of sea aster (*Aster subulatus*) plants, and when these are followed by a fairly general growth of Canadian fleabane (*Erigeron canadensis*) the land is usually fit for grass.

Strawberry clover is the essential pioneer plant in pasture establishment; it has tremendous powers of spreading over the ground by means of long stolons, and one plant ultimately will cover many square yards. The usual

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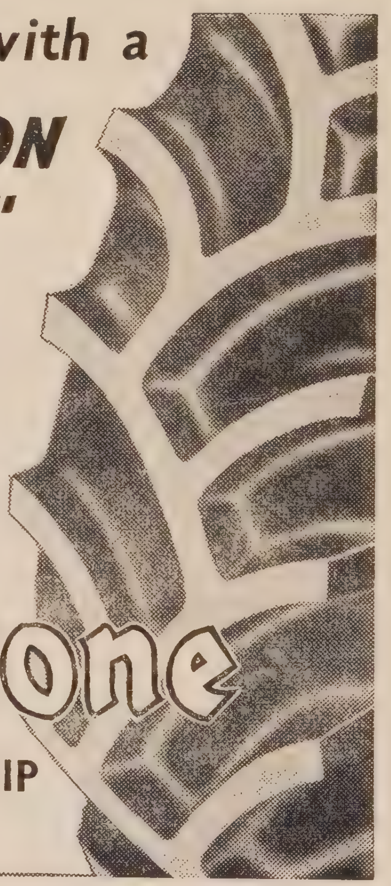

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Class 3: Flat and undulating land (white clover permanent). Rushes commonly invade pasture land of this class. They are encouraged by wet winter conditions and close and continuous grazing. Thorough drainage, the re-establishment of a vigorous sward, and controlled rotational grazing are usually necessary for rush control.

pasture mixture consists of perennial ryegrass and strawberry and white clovers, with the addition of paspalum in the warmer districts and cocksfoot and timothy in the colder. Grass growth depends on the successful establishment of strawberry clover and normally is not satisfactory until strawberry clover has colonised the whole area, but when this has occurred very highly productive milk- and meat-producing pastures are secured.

As well as on tidal flats, on large areas of moist land in river bottoms and swamps strawberry clover grows exceedingly well. Where such areas occupy the major part of a farm the tendency is to drain the land so that all-year-round stocking is possible and to change the sward from strawberry clover dominance to white clover dominance. However, where such flats are a minor part of a farm it may be more desirable to leave the land moist and use it for late-spring and summer grazing—for instance, on sand-dune country where moist flats suitable for strawberry clover are interspersed with higher land suitable only for subterranean clover.

### Class 3: Flat and Undulating Land (White Clover Permanent)

Land on which white clover is permanent and vigorous without special soil treatment occurs chiefly on alluvial river flats and terraces and consists of moist, fertile soils, generally used for dairying and fat-lamb production. Excessive winter soil moisture is usually the limiting factor in stocking and pasture utilisation, and most areas require thorough drainage, either with moles or tiles or with a combination, to reduce winter poaching and to control rush growth. Without such improvement large areas, such as the Hauraki Plains, cannot be utilised to full advantage unless the rich alluvial land is used in conjunction with dry winter run-off country.

Winter poaching is responsible for reducing production over large areas; poaching not only destroys the pasture turf and allows the ingress of weeds, but also is destructive to the soil structure and causes the land to harden and crack in dry summer weather. Rolling the sward after winter poaching to revivify the turf is a practice worthy of extension, but it is only a palliative and cannot replace thorough drainage as an ultimate necessary work for land improvement.

Over large areas rushes occupy a considerable proportion of the land surface; they are encouraged by wet winter conditions and close and continuous grazing. Thorough drainage, the re-establishment of a vigorous sward, and controlled rotational grazing usually are necessary for rush control.

The conditions which occur in soils on which white clover is permanent and vigorous are worth close study, for the chief task of the land improver is to raise low-fertility soils to the fertility status required by white clover. The brief comments made about white clover land have stressed the necessity for fertility and moisture; the soils are rich in plant food and are moist—frequently too moist in winter for the full utilisation of the feed produced. Moisture and high fertility are necessary because white clover is a very shallow-rooted plant and is intolerant of summer dryness or winter flooding. When the white clover plant germinates it has a taproot, as red clover has, but after a year or 18 months the taproot disappears and the plant depends on shallow roots which spring from the plant's stolons. Hence soils rich in plant food but dry in summer do not maintain permanent white clover, and when white clover is used in the pasture it remains vigorous only for 1 or 2 years, as is common on the wheat-growing lands of Canterbury, though it may be maintained through lax summer grazing to allow annual reseeding. Providing the rainfall is sufficient (as it is in most parts of New Zealand) and the soil retains moisture in summer, the fertility may be raised to white clover standard through the application of fertilisers and lime. The treatment required will depend on the soil: It may require lime, it may require phosphates, or it may require potash either alone or in combination. However, if the soil is dry in summer, it cannot be made to carry permanent white clover without irrigation, and subterranean clover must replace it as a pasture clover.

### Class 4: Land which Requires Fertility Building to Maintain Permanent and Vigorous White Clover

The application of fertilisers and lime and the provision of drainage works and in certain areas of irrigation may be necessary to bring land to a fertility level suitable for the permanent and vigorous growth of white clover. The most important improvement method has been liming and phosphatic topdressing, and this practice has raised the carrying capacity of millions of acres of pasture land

[*Sparrow Industrial Pictures Ltd. photo.*

The preparation of a seed-bed for grass. Large areas of New Zealand's 8 million acres of grassland sown after ploughing were established before supplies of Certified pasture seeds were available, and probably a third of the area, even under regular topdressing, is not capable of maximum production unless the swards are renewed and high-producing strains of perennial ryegrass and white clover introduced. Large areas of class 4 land should be broken up and resown on a fine, firm, moist, and warm seed-bed.

sown after being ploughed. The total area of grassland topdressed in the Dominion has risen from 1½ million acres in 1927 to 4¼ million acres in 1947.

### FERTILISER AND LIME USAGE, 1927-1947

| Year | Total fertiliser usage (thousands of tons) | Total production of agricultural lime (thousands of tons) | Total area topdressed with fertilisers and/or lime (thousands of acres) |
|---|---|---|---|
| 1927 | 292 | | 1,521 |
| 1928 | 392 | 183 | 1,952 |
| 1929 | 465 | 222 | 2,758 |
| 1930 | 526 | 205 | 2,651 |
| 1931 | 403 | 171 | 2,871 |
| 1932 | 360 | 202 | 2,454 |
| 1933 | 403 | 192 | 2,438 |
| 1934 | 376 | 262 | 2,249 |
| 1935 | 373 | 289 | 2,684 |
| 1936 | 426 | 317 | 2,882 |
| 1937 | 503 | 411 | 3,326 |
| 1938 | 611 | 482 | 3,874 |
| 1939 | 614 | 391 | 4,017 |
| 1940 | 673 | 594 | 4,187 |
| 1941 | 699 | 728 | 4,649 |
| 1942 | 502 | 613 | 4,212 |
| 1943 | 362 | 753 | 3,470 |
| 1944 | 285 | 904 | 3,370 |
| 1945 | 430 | 813 | 3,646 |
| 1946 | 507 | 930 | 3,653 |
| 1947 | 620 | 1,021 | 4,259 |

Topdressing with phosphatic fertilisers began in the early 1880's in the Waikato, where the rainfall is high and the soils are of good moisture-holding capacity but naturally deficient in phosphates. Conditions generally were unsuitable for the production of cereals and rotational farming was unprofitable. Intensive grassland farming was impossible without the raising of the fertility level of the soils. Experiments showed that topdressing with superphosphate, bonedust, and phosphatic guanos brought about a vigorous white clover growth which might be used as the basis of milk- and meat-producing pastures. Basic slag became an important fertiliser for topdressing in the early 1900's, but was largely displaced by superphosphate after 1920.

Most soils, except the most immature, require lime in addition to phosphates, and lime usage rose from less than 200,000 tons in the 1920's to more than 1,000,000 tons in 1947. Theoretically, liming where necessary should precede or accompany phosphatic dressings, but in the history of land improvement phosphates generally have been used first and have provided the revenue for liming. Young and unleached soils are very responsive to superphosphate, but on mature and leached soils liming is necessary before superphosphate is effective; it was on such soils that large quantities of basic slag and rock phosphates were used effectively in the absence of liming, though on most soils they would have been more effective with lime. Even if not fully efficient, they gave very payable results in increased clover growth, and part of the revenue earned was then reinvested in liming and more phosphatic topdressing.

In addition to lime and phosphates, potash is required by certain soils to maintain vigorous white clover growth; important potash-deficient areas are Waihi and parts of Taranaki and the Waikato. Potash has an effect similar to that of phosphates and lime: It enables white clover to grow vigorously, and if white clover grows vigorously, the grasses will also grow.

**Thus, on most soils of this land class a study of both fertiliser and lime requirements and the moisture-holding capacity of the soil is necessary. Therefore the land improver must study carefully the soil he intends to improve and first be certain that the quantities of fertilisers and lime required for improvement will give an economic return and that the moisture-holding capacity of the soil is satisfactory. Locality experience (amplified by the results of Departmental trials) is the best guide in this direction.**

Apart from the lands capable of improvement through irrigation, the two main areas of land in class 4 awaiting the hands of land improvers are, first, land now carrying pastures below the production level which is possible through the use of improved strains of grasses and clovers and not excessive applications of lime and fertilisers; and, second, land in scrub and fern.

Very large areas of the Dominion's 8 million acres of grassland sown after ploughing were established before supplies of Certified pasture seeds were available, and large areas (up to a third in intensively-farmed districts) are not capable, even under regular topdressing, of maximum production unless the swards are renewed and high-producing strains of perennial ryegrass and white clover are introduced. It is from these pasture lands that an immediate increase in primary production might be obtained through pasture renewal.

There are three main renewal methods: Surface cultivation followed by the broadcasting of seed and fertiliser; ploughing and direct reseeding; and sowing to grass after a fodder crop. Again the type of soil largely determines the most satisfactory method. Surface cultivation and seeding succeeds only where the surface soil when lightly broken affords a satisfactory seed-bed; it is most successful in light, moist soils, but may not be at all satisfactory on pastures with a complete turf which the surface cultivator does not open up sufficiently or where the surface soil is hard and cultivation is inadequate. Direct reseeding after ploughing is quite satisfactory if the work of seed-bed preparation has been thorough and the seed-bed has consolidated sufficiently to allow a good strike of white clover. If the seed-bed is not consolidated, white clover will not establish, and without white clover perennial ryegrass will not be vigorous; where the white clover strike has been poor the pasture may require 2 or 3 years to regain its former productivity.

On light land seed-bed consolidation is assisted greatly by rolling of the land on the furrow after ploughing and rolling well before and after sowing; on heavy land natural consolidation must be allowed and a complete summer fallow is usually necessary to bring this about.

The most general and satisfactory method is to plough and take a fodder crop for winter and early-spring feeding and either to spring sow (where conditions are suitable) after surface working, or to plough, summer fallow, and sow early in the autumn.

# DEVICE FOR FORMING EYELETS ON BALING WIRE AND STRAIGHTENING LENGTHS

By C. R. TAYLOR, Fields Instructor, Department of Agriculture, Rotorua.

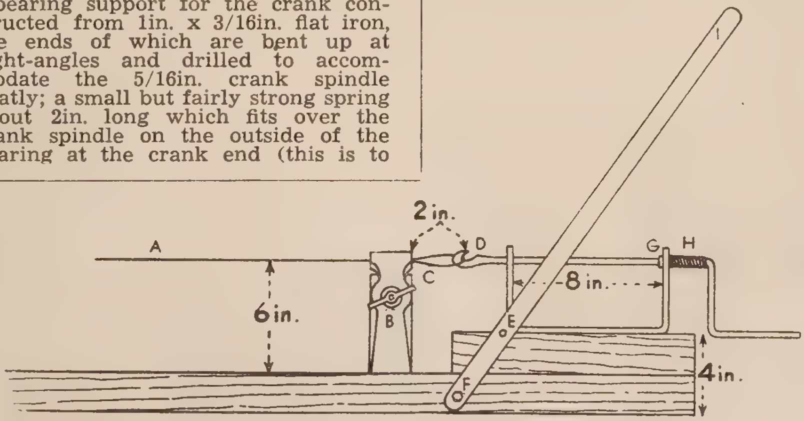
**A SIMPLE, effective, and inexpensive device for converting coiled hay-baling wire quickly into perfectly straight cut-off lengths with the necessary twisted eyelet at one end has been made and put to good use for several years by a Rotorua farmer, Mr. R. Johnson, of Te Ngae. Mr. Johnson makes about 10,000 bales of hay each year and so uses a fairly substantial quantity of baling wire. His device will also renovate once-used wire satisfactorily.**

THOUGH one man can handle the device without much trouble it has been found that two men are able to work it a great deal more speedily and with far less walking about. The quality of the article produced is at least as good as its commercial counterpart and in many instances superior to it, in that the size of the twisted eyelet can be regulated so that further manipulation with pliers is unnecessary. Moreover, a longer or shorter wire can be made as required without wasting material.

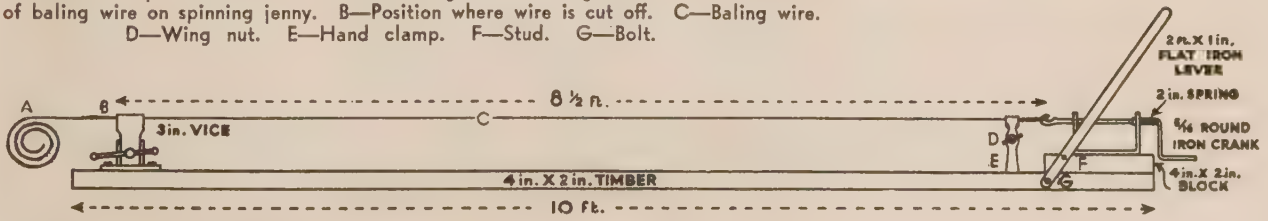
The device is simply a piece of sound 4in. x 2in. timber 10ft. long on which 2 small clamps, which hold the wire tight while the twisted eyelet is being made, are mounted 8½ft. apart. In the device illustrated the clamps are a 3in. vice and a small hand clamp operated by a wing nut. However, 2 small vices would do equally well. Other necessary parts are: An arrangement like the crank handle of a car, which is made from 5/16in. round iron and is used to form the eyelets; a 2-bearing support for the crank constructed from 1in. x 3/16in. flat iron, the ends of which are bent up at right-angles and drilled to accommodate the 5/16in. crank spindle neatly; a small but fairly strong spring about 2in. long which fits over the crank spindle on the outside of the bearing at the crank end (this is to provide sufficient forward movement in the spindle to enable it to disengage from the formed eyelet in the wire without the wire having to be released from the 2 clamps); and, finally, a flat-iron lever about 2ft. long fitted with a 1½in. long stud near the lower end, over which the twisted eyelet is placed when the wire is being straightened.

Any handy man should be able to construct the device in a short time, using mainly scraps of material usually to be found on most farms.

Where coiled baling wire is used and it has to be cut into lengths and provided with an eyelet or loop the device described will make a first-class job in a fraction of the time that several men would take to do the work by hand with pliers, and the product will be superior to that made by the latter method. In fact, Mr. Johnson considers his invention an indispensable part of his comprehensive range of harvesting equipment.

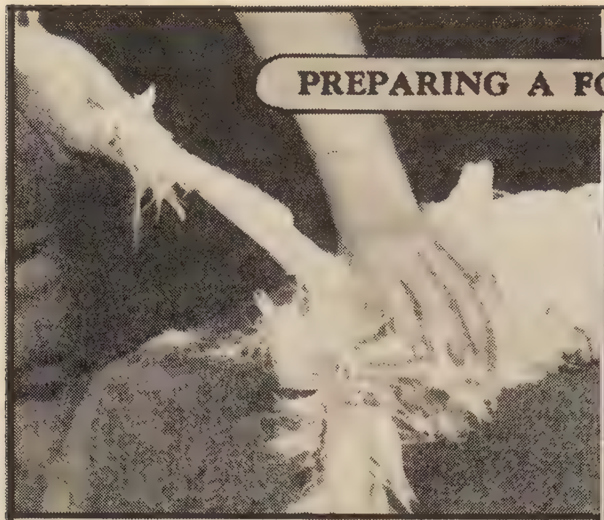


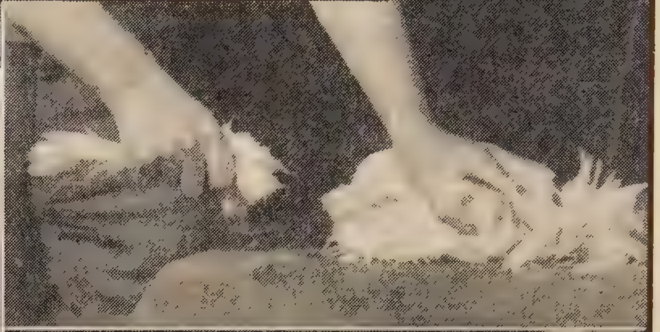
Above—Details of crank end of device. A—Wire. B—Wing nut. C—2in. wire loop fixed into the slot on the spindle and with ends fastened in the clamp; 2 or 3 turns of the crank make an eyelet in the wire. D—End of spindle, which is hammered flat so that a slot can be cut in it. E—Stud. F—Bolt. G—Collar welded to spindle to allow movement of about 1in. against spring tension, which permits sufficient movement in the spindle for the eyelet to be released. H—Spring to take up end movement in spindle. I—Lever. Below—Diagram of baling wire device. A—Coil of baling wire on spinning jenny. B—Position where wire is cut off. C—Baling wire. D—Wing nut. E—Hand clamp. F—Stud. G—Bolt.

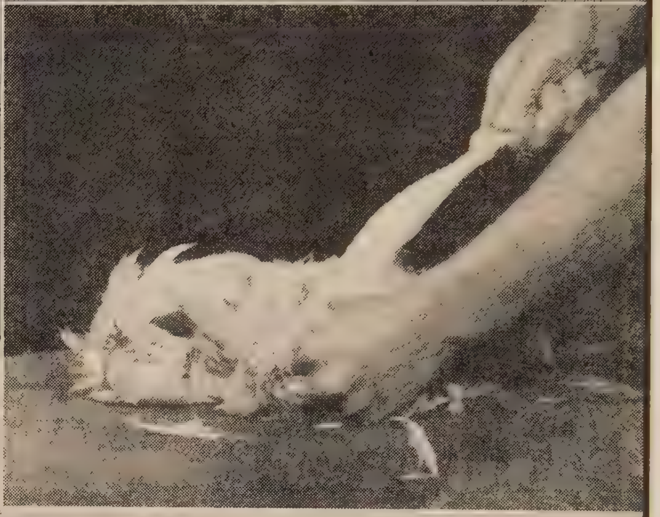


Upper—Two or three turns of the crank are sufficient to form a well-twisted eyelet. Lower—When the eyelet has been made the wire is released from the spindle and clamp and placed over the stud on the lever, which is then pulled to straighten the wire, the far end of which is still held in the vice.

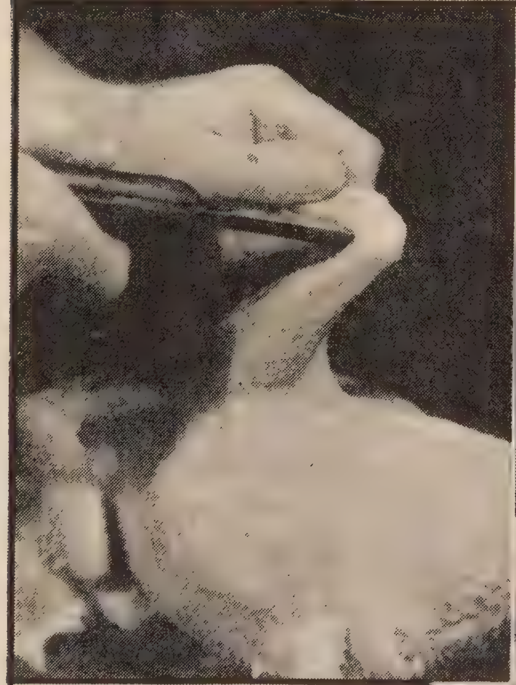
# PREPARING A FOWL FOR COOKING

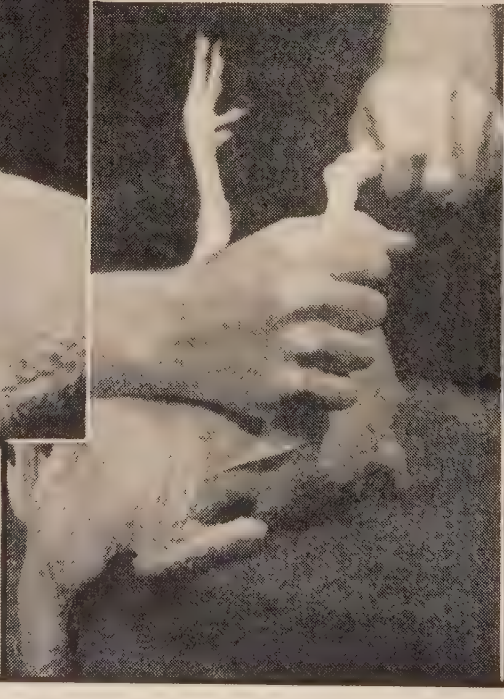


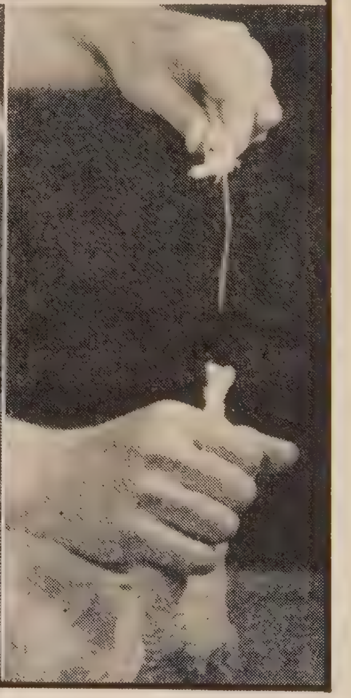




After the bird has been scalded, the wings are plucked first (above), all the feathers being taken off each wing in one pull, then the tail (upper right), all at once, and then the legs (right).







To cut off the shank, the leg is bent and a small nick made at the back of the joint (above), then the shank bent back (right) to loosen the sinews, which come away with the shank (extreme right).

# Household Poultry: Culling the Laying Pen—Preparing Table Birds for Cooking—Preserving Eggs—Progress of Pullet Rearing

**APART from the important working principle that all poultry keepers should regularly cull out poorly-producing pullets and hens, the approach of Christmas makes appropriate a discussion of the way to go about quitting birds no longer profitable and how to kill, pluck, and clean them for consumption. Thought must also be given to the new generation of birds to replace those killed off, and to the period between the time when the old fowls finish laying and the new pullets begin so that provision can be made for eggs during that interval. Advice on these subjects is given in this month's article for the household poultry keeper by W. L. McIver, Poultry Instructor, Department of Agriculture, Hamilton.**

FIRST, the difference between hens and pullets must be understood, as one expression should not be used automatically to include the other. A pullet is a female bird which has not completed its first year of laying and has not gone into a major moult. Sometimes pullets moult partially, around the neck, or even entirely during winter when they are 10 or 11 months old, but that does not remove them from the pullet classification. Almost without exception fowls moult fully after about 12 months in production and have about 3 months' spell. They are then hens and, though at this stage they are about 18 months old, for the next 12 months they are called first-year hens. A year later they become second-year hens. In December the average first-year hen is 2 years 3 months old and a second-year hen is 3 years 3 months old; a bird hatched in September, 1948, and now 1 year 3 months old is still a pullet.

The importance of this distinction between pullets and hens lies in the fact that almost all birds lay fewer eggs in their first hen year than in their pullet year and fewer still in their second hen year. This fact must be taken into account when culling out poor or non-producers.

## Culling the Laying Pen

The length of time for which a laying bird should be kept cannot be defined in terms of months or years, and the general standard of 2 years implies only a very broad principle. Some pullets are uneconomic after 4 or 6 months' laying, and some hens are good for several years. Each bird should be judged on its merits and poor layers discarded promptly. Looking on hens as household pets is not the correct attitude. Certainly, they should be treated kindly and all possible consideration given to their welfare, but they are in the laying pen for only one purpose—to produce eggs. Irrespective of age, a bird which is not doing its duty should be culled out.

Observation, a little knowledge of laying characteristics, and comparatively little practice will soon enable anyone to do his own culling, especially with White Leghorns, which show plainly discernible signs which are not so apparent in heavy-breed strains. If only a few birds are kept, the owner usually knows each pullet and hen as an individual and observation gives him an opportunity of knowing the dependable layers and suspecting the poor ones. Having formed an opinion of their merits from day-by-day observation, he can then judge the birds by taking account of the time of year and a comparison of the important signs. December comes at the end of a flush laying period and it can now be expected that some pullets and a few hens should go off the lay. In January still more will do so, and even greater declines can be expected during February and March. Up to the middle of February non-producers should be culled out immediately and, if there will be enough housing for some of the birds for another year, those which continue to lay later than mid-February should be selected.

The comb of a good layer has a moist, fresh apearance and obviously is served by a good supply of blood; this indicates that the ovary is active. The non-layer has a smaller, dried up, shrivelled comb. Experience soon permits the judging of stages between, mainly by comparing the bird under observation with the average flock member; if it has different unfavourable characteristics from the others, that is evidence against it.

The layer has soft, pliable pelvic bones on each side of the vent, with a space between them of the width of two fingers or more. In the non-layer those bones are close together, hard to the touch, and, if the bird has been off the lay, covered with fat. Frequent handling and comparison soon teach the meanings of exterior signs. The space between the pelvic bones of heavy-breed and cross-breed strains is not as wide as in light breeds when the birds are in moderate lay. This might cause some to be adjudged non-layers, but the best way to gain experience is the hard way of making a few mistakes, which show up when the ovary is examined after the bird has been gutted for cooking.

Yellow-legged varieties, which include White Leghorns, have the further feature of leg colouring as a guide. Soon after beginning to lay Leghorns start to lose the yellow colour and go pale in the shanks. The colour does not return until after they have stopped laying. If a few birds show leg colour when all the rest do not, that is sufficient evidence to warrant picking them up and handling them for the other signs of non-laying.

The next step is to judge whether the bird is off the lay because it is a poor producer or because it is failing in health. The best guide is body condition: If the bird is well fleshed on the breast, keel, and legs, it can be classed as an uneconomic layer and reserved for table use, but if it is thin and in poor condition generally, it should be buried. If there is doubt, the bird may be plucked and cleaned and the internal organs, especially the liver, examined; if they are in proper condition, the fowl is fit for consumption.

**Ailing pullets and hens are a danger to their flock mates and should not be kept. Even if a sick bird recovers, it causes such a loss by decline in egg production that as a rule it cannot make up the leeway and the value of the food eaten while off the lay. Obviously-sick birds cannot be shown sympathy.**

An article in this series in the "Journal" for March, 1949, gave advice on points to be looked for in selecting fowls suitable for breeding.

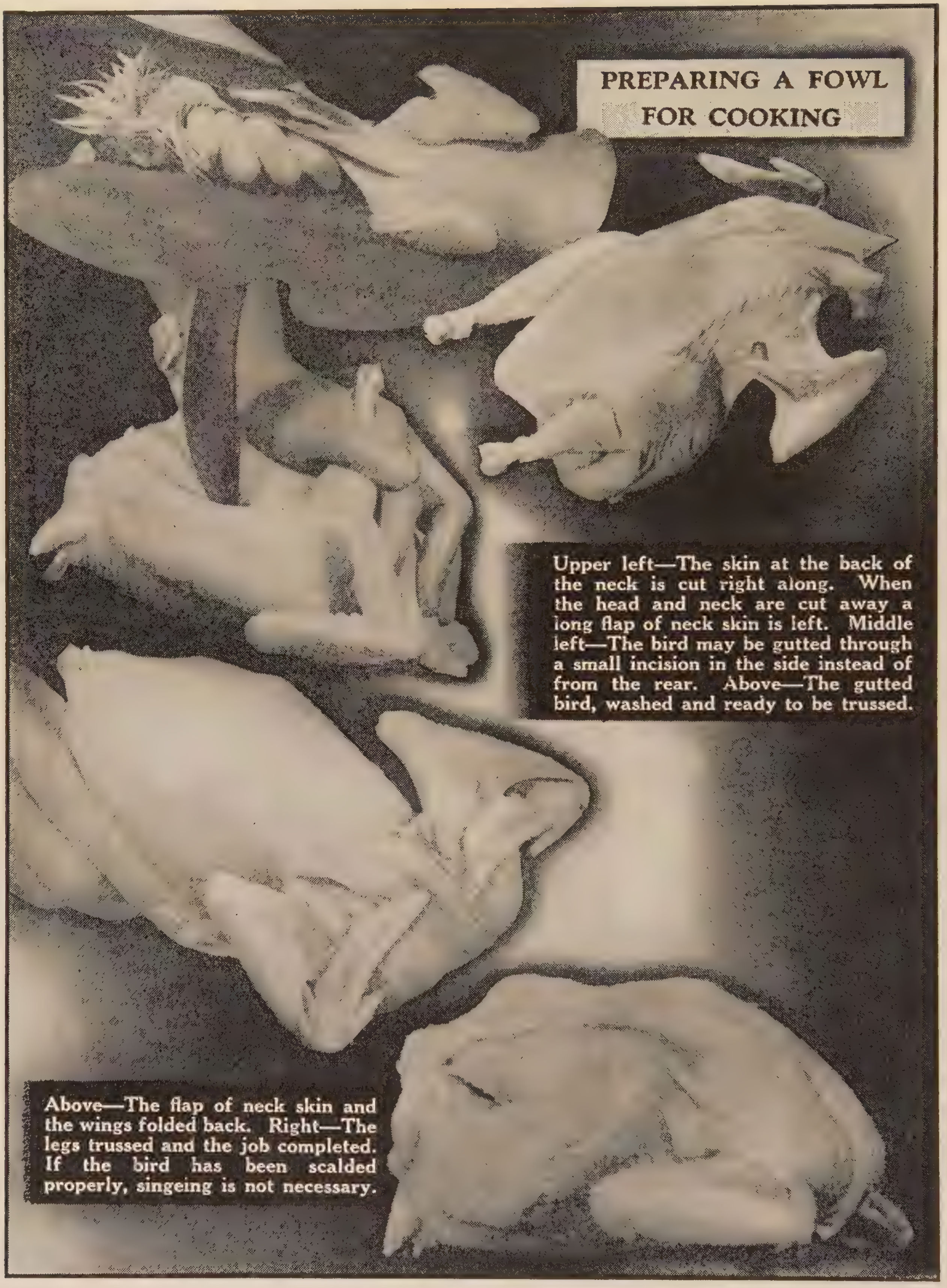
## Preparing Table Birds for Cooking

Few householders have proper facilities for fattening hens, but a small coop can be built and nailed to one of the inside walls of the laying house. Most non-layers will already be fat enough for immediate killing, but an early moulter might be a little low in condition. Such birds may be kept in the coop so that they remain inactive, fed amply, and given easily-digested food. Usually it is not advisable to waste much time or food on fattening culls, especially if costly foodstuffs are used.

Far too many household hens are left alive because the owners do not know how to kill, pluck, and clean the culls and think the job is disagreeable, but the whole procedure is really very simple. If the bird is killed by the neck-dislocation method, it will bleed without trouble. A demonstration should be sought, as it is easier to follow than a written description.

Dry plucking is rather slow and difficult for the amateur. Wet plucking is easier, especially if the bird is to be cooked within 24 hours or so. Most people when dipping a fowl in hot water before plucking it either leave it in too long, thus softening the flesh and causing the skin to tear, or have the water too cool, so that little advantage is obtained. With an older fowl it is better to have the water close to boiling point, but to submerge the bird for the minimum of time. The water should be brought to the boil, a little cold water added, and the fowl dipped for only 20 to 25 seconds. Pulling a single wing feather shows whether the bird has been dipped adequately; if it comes out easily, the scalding has been sufficient. The work should be hurried on with after the bird has been given a shake to throw off the surplus water, which otherwise would leave the feathers too hot to be handled. The wing feathers should be plucked first, the

# PREPARING A FOWL FOR COOKING



Upper left—The skin at the back of the neck is cut right along. When the head and neck are cut away a long flap of neck skin is left. Middle left—The bird may be gutted through a small incision in the side instead of from the rear. Above—The gutted bird, washed and ready to be trussed.

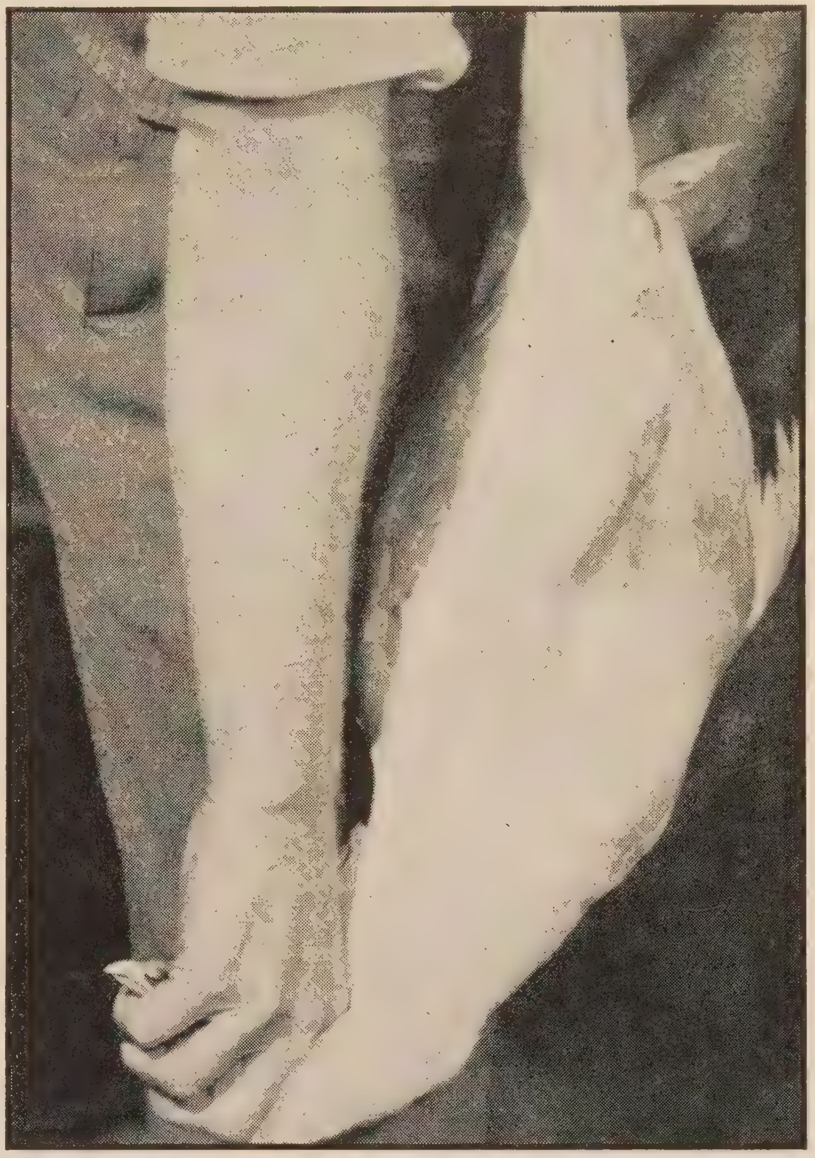
Above—The flap of neck skin and the wings folded back. Right—The legs trussed and the job completed. If the bird has been scalded properly, singeing is not necessary.

tail next, then the legs and thighs, thence from the tail along the back to the shoulders, then the neck, and last from the abdomen to the breast. The feathers should be plucked not with the finger tips but with the palm of the hand and the flat of the fingers. For the wings, tail, and legs the fingers are folded back to the palm to form a circle, but the body feathers are pushed off with the palm open. Only the few feathers left adhering to the carcass are pulled out with the finger tips. Experience will enable a comparative novice to dip and pluck each bird in a minute or less, but the temperature of the water must be high enough and the immersion time just right—neither too short nor too long. Too long immersion is worse than too short, as it causes the feathers to reset and they must then be loosened a second time, in which case the skin is certain to be too softened and will tear readily.

The neck can be severed and the shanks cut off at any stage after the bird has been plucked, but the most convenient time is before the "innards" are drawn. Sometimes pulling out the crop is a little difficult. If there is food in the crop, it can be taken out from the front end, but if it is empty, it can be pulled out from the rear, as it is, of course, connected to the stomach. To prevent the connecting passageway breaking under the strain of the pull, the crop should be loosened from the neck skin. With a very young bird this loosening may not be necessary, but the older the fowl the firmer is the adhesion. Instead of cutting a gaping hole at the rear of the abdomen a very small cut may be made in the side near where the last ribs join the backbone; all the organs cannot then be taken out in one pull, but they come out readily in smaller sections if first the gizzard and then the intestines are pulled away, followed by one pull for the liver and heart. The neck and the giblets—heart, gizzard, and liver, with the gall bladder and spleen cut away—should not be wasted; they can be either cooked with the carcass or made into soup.

This method of gutting enables the carcass to be self trussed without the use of string. If another small hole is made on the other side of the abdomen fairly close to the leg where it joins the body, one thighbone can be tucked into the hole on each side. The neck skin can be pulled back over the shoulders and the wings folded to grip this skin. The cook then does not have to sew up the loose skin either at the neck end or the rear end after stuffing the bird. Because the thigh bones are tucked inside the abdomen, there is less danger of the meat shrinking down the drumstick if the oven is overheated during cooking, as a slight excess of heat will be conducted quickly from the leg bones to the abdominal skin. The cooked bird then looks more attractive.

[The cooking of poultry is the subject of an article by Edith G. McNab, Rural Sociologist, on page 519.]



[*Fraser Niederer photo.*

**The final action in the neck-dislocation method of killing a fowl. All the pressure is on the head, and the neck is twisted in addition to being stretched.**

## Preserving Eggs

Layers are just reaching the end of the flush laying season and egg prices will soon begin their seasonal rises, so if attention has not already been given to preserving a supply of eggs for next winter, now is the time to do it. This advice also applies to housewives who do not keep fowls and want to avoid an egg shortage.

The number of eggs to be preserved depends not only on the size of the family but also on the system used for replacing stock. If only hens are run, there will be a period of about 3 months from April to June with very few or no fresh eggs, but if all the hens are sold in January and the housing restocked with pullets hatched in early September, there will be very few weeks without eggs. The only way to ensure having fresh eggs all the year round is to run both pullets and hens, but in that case the pullets must be hatched sufficiently early to permit them to come into production before the hens go off the lay, and pullets should be housed separately from hens.

Several reliable egg preservatives are on the market and the packets contain directions for use. Only clean, good-shelled, fresh eggs should be preserved. They must be free of even fine cracks in the shell. Usually vision is not enough to locate such cracks, but sound shells can be assured by lightly tapping two eggs together, when even a novice can tell the tone of a cracked shell.

## MANAGEMENT OF HOUSEHOLD POULTRY . . .

**Experimental studies have shown that with reliable preservatives the loss in the vitamin content of eggs stored for 6 to 9 months is so small as to be negligible.**

When preserved eggs are used in cooking each one should be broken separately into a saucer as a precaution before tipping it into the other ingredients.

### Progress of Pullet Rearing

By December provision should have been made for replacement pullets for next season's laying. Householders have had the choice between breeding from their own hens and buying stock; between buying them at day old or at the perching stage; between buying them sexed or unsexed; and even between buying them at 6, 8, or 10 weeks of age or ordering them for delivery when they are near laying. Some of these courses are not open now, but if pullets are required to replace old birds being culled out, early arrangements should be made for their purchase. The aim should be to have the pullets from 12 to 15 weeks old in the case of light breeds and 16 to 19 weeks old with heavy and cross-breeds by Christmas time.

Many householders rear their replacement stock from chicks hatched in November and even later, but these birds will be late in coming into production and will not show the margin of profit that will be given by chickens hatched in August or September.

**Poultry keepers who are now rearing young chicks should bear in mind that, proficient as the mother hen has become through the ages, Nature has put obstacles in the way of any plant, animal, or bird crowding out the rest. Consequently, provision must be made to guard against the weather, disease, parasites, and natural enemies.**

A broody hen which is to rear chicks must have proper shelter. A weatherproof box or coop with an adjustable door and reasonable ventilation should be placed in a dry position, safe from flooding in the event of a storm. It must be sufficiently roomy and should have a wire-netting coop adjoining for a run. This coop is made with a wooden frame, the netting being stretched over two sides, one end, and the top. The uncovered end is placed against the box coop. Both units should be moved frequently to clean positions on short grass. The hen and chicks can be allowed to range outside the coop on suitable days if there is no danger from natural enemies or of damage being done to the adjacent garden.

It is essential that the mother hen be in good health, free from contagious disease, scaly leg, lice, and intestinal worms. She should be treated and freed from parasites before the chickens are given to her. Her quarters should be treated for red mite. These troubles are certain to be passed on to the chicks if the broody hen has any of them.

If artificial brooders are used, when the chicks no longer need the heat and have learned to perch they should be transferred to their growing quarters. They should be neither left with the mother hen or in a brooder coop which has become too crowded nor transferred into the hen house with the layers. If space is restricted, the hens should be kept inside their house and the growing pullets given all the fresh, clean run space possible—recently-spelled land with ample greenfeed coverage. The elaborate type of house required for the layers is not necessary for the pullets. All they need is reasonable shelter (mainly at night), perches 3 to 4in. wide, clean feeding troughs (and perhaps hoppers), drinking vessels kept in a cool spot, and a box of grit. As long as ventilation is ample and the flooring can be cleaned out readily almost any simple type of rainproof shelter is sufficient. Instead of a solid floor to the colony house good-quality netting stretched tightly over the floor supports allows droppings to fall through so that the pullets cannot scratch among them. The pullets should be transferred to their laying quarters when they redden up just before coming on to the lay.

Seasonal culling should not be restricted to the older birds. The progress of the growing stock should be watched constantly and the owner should not hesitate to cut the potential loss of profits from backward pullets. Retaining backward and ailing pullets is a waste of time and feeding cost, and hoping that they will catch up to the others later is too optimistic. They are a danger to the rest, as it is the weaklings that contract diseases first.

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# A. AND P. SHOW DATES

FOLLOWING are the dates and venues of A. and P. shows up to the end of February.

December 3—Winton A. and P. at Winton.

December 3—Tokomairiro A. and P. at Milton.

December 3—Whangaroa A. and P. at Kaeo.

*December 3—Hauraki A. and P. at Paeroa.

December 6 and 7—Gore A. and P. at Gore.

December 10—Motueka A. and P. at Motueka.

December 10—Wyndham A. and P. at Wyndham.

*December 13 and 14—Southland A. and P. at Invercargill.

December 17—Otago Peninsula A. and P. at Portobello.

January 2—Nuhaka A. and P. at Nuhaka.

*January 13 and 14—Wairoa County A. and P. at Wairoa.

January 14—Waikouaiti A. and P. at Waikouaiti.

*January 21—Tauranga A. and P. at Tauranga.

January 21—Marton District A. and P. at Marton.

January 21—Central Hawkes Bay A. and P. at Waipukurau.

January 27 and 28—Horowhenua A. and P. at Levin.

January 27 and 28—Taumarunui and District A. and P. at Taumarunui.

January 28—Waiau A. and P. at Tuatapere.

January 28—Helensville A. and P. at Helensville.

*January 31 and February 1—Feilding I. A. and P. at Feilding.

February 4—Palmerston and Waihemo A. and P. at Palmerston.

February 4—Rodney Agricultural Society at Warkworth.

*February 4—Woodville A. and P. at Woodville.

February 4—Clevedon A. and P. at Clevedon.

February 4—Golden Bay A. and P. at Takaka.

*February 7 and 8—Dannevirke District A. and P. at Dannevirke.

February 10 and 11—Rangitikei A. and P. at Taihape.

February 10 and 11—Taranaki A. and P. at New Plymouth.

February 11—Murchison A. and P. at Murchison.

February 11—Hukerenui A. and P. at Hukerenui.

February 11—Katikati A. and P. at Katikati.

February 11—Waitemata A. and P. at Waiwera.

*February 11—Pahiatua A. and P. at Pahiatua.

February 11—Putaruru A. and P. at Putaruru.

February 15 and 16—Ohura A. P. H. and I. at Nihoniho.

February 16—Christchurch Stud Ram Fair at Christchurch.

February 16 and 17—Christchurch Flock Ram Fair at Christchurch.

February 17 and 18—Franklin A. and P. at Pukekohe.

February 17 and 18—Masterton A. and P. at Masterton.

February 18—Northern Wairoa A. and P. at Mititai.

February 18—North Kaipara Agricultural Association at Paparoa.

February 18—Te Puke A. and P. at Te Puke.

February 22—Te Awamutu A. and P. at Te Awamutu.

February 22—Opotiki A. and P. at Opotiki.

February 25—Waiapu P. and I. at Ruatoria.

*February 25—Whakatane and Rangitaiki A. and P. at Whakatane.

February 25—Waimarino A. P. H. and I. at Raetihi.

February 28—Otorohanga A. and P. at Otorohanga.

* The Department of Agriculture exhibit will be staged at this show.

# THE HOME GARDEN IN DECEMBER

By S. O. GILLARD, Vegetable Instructor,
Department of Agriculture, Auckland.

**DECEMBER is a very busy month for the home gardener, as there is much important work to be done. This includes thinning, weeding, hoeing, spraying, and planting out of late-autumn and winter greens such as cabbage, cauliflower, broccoli, and leeks and making successional sowings of dwarf and runner beans, beetroot, and, in some districts, swedes, parsnips, peas, carrots, and sweet corn.**

IN the home garden where seasonal operations have been well planned there should be no difficulty in finding space for successional crops, but by the end of the month the garden should be filled to capacity with a wide range of newly-planted, growing, and maturing vegetable crops.

Where space is limited interplanting may be done. Quick-maturing vegetables such as lettuce, radish, and spinach are well suited for planting between rows of vegetables which take longer to mature. Cabbages, cauliflowers, and root crops may be planted between rows of maturing potatoes, peas, and beans, and pumpkins, cucumbers, and melons may be interplanted with sweet corn. Vegetable plants such as tomatoes, pepper, and egg plants which are subject to wind damage, especially when young, can be protected in exposed positions by planting them between maturing crops of peas or cabbage.

As earlier-sown crops mature and are harvested no time should be lost in digging the ground and preparing it for replanting, always remembering that crop rotation gives best results. Leaf crops such as cabbage, lettuce, silver beet, etc., should follow potatoes, parsnips, or other similar root crops, and root crops should follow leaf crops. Because both are affected by similar diseases, tomatoes and potatoes should not follow each other.

Successional sowings of salad crops such as lettuce, spring onions, and radish can be made, and turnips, swedes, and peas may be sown if a supply of moisture can be assured. In the North Island parsnips and sweet corn can still be sown, and tomatoes may be planted for late crops in the warmer districts which are not subject to early frosts.

Trenches and beds for celery should be prepared and plants set out. The plants should be kept sprayed with Bordeaux mixture or with certified copper oxychloride mixture to protect them from leaf spot, caused by the fungus *Septoria apii*, which is one of the most serious diseases affecting celery.

[*Sparrow Industrial Pictures Ltd. photo.*

Where garden space is limited quick-growing vegetables like radish can be grown between rows of established crops.

[*Green and Hahn Ltd. photo.*

Weeding and hoeing are necessary in December even among well-established crops. Hoeing assists aeration and conservation of soil moisture.

For summer sowing lettuce is best sown in a permanent bed and thinned, as transplanting is rather difficult in hot weather. From December until April all vegetables should be sown or planted on the flat, and subjects like cabbage, cauliflower, brussels sprouts, and leeks can have the earth drawn up to them as they grow. This method of planting is important during the drier and warmer months; it also provides a better surface for artificial watering and liquid manuring.

Weeding and hoeing are still very necessary even among well-established crops. Weeds not only rob plants of food and moisture, but they are often the host plants of disease and insect pests. Hoeing assists aeration and conservation of soil moisture.

Runner beans should be staked and tall varieties of tomatoes will require staking and pruning; in localities where blight is troublesome they should be sprayed with Bordeaux mixture or with a copper oxychloride spray to which has been added arsenate of lead or commercial D.D.T. wettable powder for the control of tomato worm.

Harvesting of main-crop rhubarb should now be discontinued and the plants allowed to develop leaf growth to enable the crown to build up supplies of reserve food for the production of next season's crop. Where heavy pulling of the stalks has been practised leaf growth will be stimulated by a dressing of blood and bone applied at the rate of ½lb. per square yard between the plants and worked lightly in.

Liquid manure can be applied to most crops to advantage and where necessary watering or irrigation should be attended to. The supply of water is particularly important to the growth and setting of beans, to the growth of radish, lettuce, and celery, and, to a slightly less extent, to other growing vegetable crops. Crops of vegetables such as potatoes and onions that are nearing maturity should not be watered, as this is liable to start them into a second growth and to impair seriously their keeping qualities later.

Kumara plants will now be developing runners and these should be lifted occasionally to keep them from rooting at the nodes. If allowed to attach themselves to the soil, they make heavy vine growth at the expense of tubers. The soil should be kept moulded up to maintain the ridges in which the tubers form, and all weeds should be carefully removed.

# THE HOME GARDEN IN DECEMBER . . .

The onion crop will now have reached the stage when the bulbs are forming. In any further cultivation work necessary to suppress weed growth the soil should not be drawn up to cover the bulb, which develops best on top of the ground. If planting has been a little too deep, it is an advantage to press the soil away from the onion and expose the bulb as is shown in the illustration on this page. In doing this care must be taken not to damage the roots of the plant.

## Asparagus

In districts where harvesting has been in progress for a period of 8 weeks (usually round about the end of November for northern and toward the end of December for southern districts) cutting of the spears should be discontinued. The beds should be weeded and lightly cultivated and should receive a dressing of blood and bone manure at the rate of ½lb. per square yard plus ½oz. of sulphate of potash per square yard; if available, a good dressing of wood ashes can be substituted for the potash.

Compost spread over the surface soil is excellent and will also assist the growth of a strong, healthy fern, which is so necessary to enable the roots to develop and store up food for next season's growth. Strong fern growth also assists in the suppression of weeds, and once it becomes established the beds should require little attention during summer.

## Broad Beans

Broad beans sown in May under reasonable conditions will be ready for picking in October, and later sowings will extend the harvest period to December, when they are of value in the home garden, as the varieties of vegetables ready for harvesting at that time are rather limited. As the plants begin to flower or when they are about 2ft. high pinch the top out of each stem, as this makes the pods set better. When boiled like spinach the tops of broad beans make a delicious vegetable. To maintain the strength of the plant and to prolong the bearing period the pods should be gathered as they become ready for use. Once the plants are allowed to mature their seeds they stop flowering and die off.

## Dwarf and Climbing Beans

Provided sufficient moisture is maintained, french beans may be harvested in northern districts from the beginning of December until the plants are cut down by early winter frosts. To secure continued harvesting during this period it is necessary to make successional sowings every 3 weeks right up to the end of January. In the colder parts of New Zealand the season for beans is, of, course, much shorter, but should be spread as long as possible by using the warmest positions for early and late sowings. Sown under favourable conditions dwarf beans produce their first beans in 7 to 9 weeks; annual climbing beans require 10 to 12 weeks. For late sowing the situation should be warm and sheltered, particularly if there is a likelihood of a cool autumn.

[*Sparrow Industrial Pictures Ltd. photo.*

Onions form bulbs best on the surface of the ground, and when they are planted too deep the soil should be pressed away from the plants.

Beans will grow in many types of soil, but prefer a good friable loam well supplied with organic matter. If the soil is not low in food material, the only manures required are a mixture of equal parts of superphosphate and bonedust sown along each side of the rows at the rate of 4oz. to 8ft. of row when the plants are well up. Artificial fertiliser should not be sown with the bean seed, as it may cause poor germination of the seed through burning.

For dwarf varieties drills 18in. to 2ft. apart and 3 in. deep are drawn out with the hoe. The seed is sown in a double row along the wide drill, the seeds being "staggered" and not placed opposite each other; seeds should be 3in. apart. Cover the seed with soil and rake the surface level.

Climbing beans require support. This may be provided by a wire-netting fence, preferably 6 to 8ft. high, the seeds being set 6 to 8in. apart in a single row each side and 5in. out from the netting. Alternatively the beans can be supported by wooden stakes 6 to 8ft. long placed in a double row and spaced 1ft. apart each way. The stakes are drawn together in pairs at the top and attached to a cross stake; two seeds are set, one each side of the stake.

Another method is to place 4 stakes 6 to 8ft. long 2ft. apart each way to form a square. The tops are drawn together wigwam fashion and tied, the operation being repeated to form a row of wigwams; 3 seeds are set to each stake.

When vines of climbers are 2ft. 6in. high the tops of runners should be pinched off. This causes the flower buds to form much lower on the vine than if it were let grow at will. This operation can be repeated when the vine has grown another 2ft. in height.

Watering may be necessary during dry spells. Dryness of the root is often a cause of disappointment with the bean crop and is the main cause of the flowers failing to set. The hoe should be kept busy suppressing weed growth during dry weather.

**Varieties recommended** for planting during December and January are:—

**Dwarf:** The Prince, Sydney Wonder, Black Valentine, and Surprise.

**Climbing:** Fardenlosa and Market Wonder.

## Carrots

Carrots may be classified into the following types:—

**Long-rooted:** Mature roots may be 10in. long or more and taper to a distinctly long, drawn-out point. They penetrate deeply, and therefore the plants may get more water once established than shorter-rooted kinds. This may be important in dry seasons in certain areas. Long-rooted varieties do best on a comparatively light, deep soil of medium quality. Recommended varieties are Intermediate and Altringham.

**Medium length:** Usually less than 8in. in length. The varieties of this group, Chantenay, Earlykrop, Man-

[*Sparrow Industrial Pictures Ltd. photo.*

Celery grows well in beds on the flat if soil moisture can be maintained. The stalks are blanched by placing boards along the sides of the bed.

chester Table, and the so-called "coreless carrot" Nantes, are of excellent quality.

**Short, stump rooted:** Useful for heavy or for shallow soils. Examples are Oxheart (Guerande), Early Scarlet Horn, and French Forcing.

**Recommended varieties** for December and January sowings are Chantenay and Earlykrop.

Successional sowings of carrots are best, as the crop can be used before it reaches full maturity. The roots are of a much higher quality when young, and if kept too long after reaching the mature stage, they become pithy and lose their flavour.

In districts where the carrot rust fly is prevalent it is very difficult to produce a crop of good-quality roots if seed is sown before December or January unless special precautions are taken. Carrots sown now will have plenty of time to grow to maturity and will result in better-quality roots for winter use than if sown in spring.

Carrots do well without further manurial applications in a soil that has been heavily manured for a previous crop; if this is not available, the only fertiliser necessary for most soils is a mixture of equal parts of superphosphate and bonedust at the rate of 2oz. per square yard. A dressing of wood ashes will also be beneficial and can be applied with the fertiliser when raking down the soil before seeding. Sow thinly ½in. deep in rows 12in. apart and thin out when the plants are 3in. high to 3in. apart. A quarter of an ounce of seed will sow 100ft. of row.

## Celery

Celery (*Apium graveolens*) is a native of the marshy places of Europe, being known in its wild state as "smallage." The only apparent references to its early cultivation deal with its use as a medicine. In its wild form it has a spreading habit growth and a bitter, pungent flavour and odour. Originally the cultivated celery differed very little from the wild form and most of the early varieties were more or less hollow stemmed. By careful selection and breeding this tendency has largely been eliminated and the plants having hollow stems throughout are now rare. It is one of the main crops of those eaten raw. It is also used in salads, in soups, and as a relish with cheese.

**Celery is moisture loving, and an adequate supply of moisture during growth is essential.**

Celery is seldom grown successfully from seed sown directly in the garden. It is best sown under glass and should be sown about 10 weeks before the plants are required for planting out in the garden. If it is desired to grow plants, seed should be sown fairly thickly—about a level teaspoonful to a standard tray (22in. x 12in. x 3in.)—and covered very thinly by a sprinkling of soil, which is firmed with a flat piece of board. The seedlings should appear in from 1 or 2 weeks and during this period the seed-box should be carefully watered.

When the seedlings are large enough to handle—usually about 3 weeks after emergence—they should be pricked out 2in. apart each way in seedling boxes filled with a good compost mixture. Four to 6 weeks from pricking out, the plants will have made sufficient root growth to enable them to hold the attached soil when cut out of the boxes in squares. They may then be set out in the garden, and if they are carefully planted, little check to growth should occur.

With early celery a problem is to prevent the plants getting a check which would cause them to bolt to seed; seed sowing should be so timed that the plants will be ready for planting out after danger of prolonged cold, wet weather is past. For the main and late crop the seed may be sown in an open nursery bed.

Most home gardeners will prefer to purchase plants from seedsmen rather than raise them from seed, as few gardeners, except those in the warmer and more sheltered districts, can sow and raise plants successfully without a cool frame or small glasshouse.

Two methods of planting are used—the bed and the trench systems. Trenches are preferable where conditions are dry, as beds are usually more difficult to water. The plants can be set in double rows in trenches; for early or late planting they can be planted on the level or in slightly raised beds containing four or six rows 12in. apart with 8in. between the plants in the rows. Trenches should be shallow except where it is intended to earth up the plants for blanching later. The soil in the trenches should be enriched with well-rotted farmyard manure or compost. For beds the ground should be deeply dug and well worked.

Celery should be grown rapidly without checks and succeeds best in a very rich soil. Just before planting, a fertiliser mixture consisting of equal parts of blood and bone and superphosphate plus 5 per cent. of sulphate of potash or muriate of potash should be broadcast over the area at the rate of 1lb. per square yard and worked into the surface 3in. of soil.

Plants should never be permitted to become dry at the roots. As the major portion of the plant roots occupy the upper 6in. of soil, and many of the roots are within 2 to 3in. of the surface, adequate moisture must be maintained and cultivation should be shallow. Raised beds are best when drainage is poor and watering does not present difficulty.

When the crop is about 3 weeks from maturing blanching should be started. This is done by excluding the sun from the stalks of the plants, thus preventing the formation of chlorophyll (the green colouring matter) in the plant cells. A good practice in blanching is to surround each bed with high boards which should be at least 10in. wide. The method of placing the boards is to lay them flat on either edge of the path along plant rows, force the inside edge against the plants, and then raise them to a vertical position, bringing up all the outside leaves. The boards are kept in position by short stakes placed on the outside.

Another method is to cut sections of wrapping paper and wrap each celery plant separately, leaving only the tops of the plants exposed. Blanching by drawing the soil up around the plants is not the best method, although it is commonly practised by home gardeners. In warm weather it may cause the plants to decay and favours development of leaf spot and injury to the stalks.

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5·9

Varieties exemplifying three types of celery are:—

**Golden self-blanching type: White Plume:** Dwarf habit; a good early variety. **Gilt Edge Golden:** A stocky, very heavy, perfectly solid variety with a splendid flavour; it is the variety most popular with commercial growers.

**Late type: Solid White:** Excellent late variety; very hardy. The best of the English large, white-stemmed sorts.

**Pink or red type: Superb Pink and London Prize:** Flavour is nut-like, quite distinct, and pleasant; the pink, red, or purplish colour is distributed over the outer stalks, but mostly at the margins of the inner stalks, which are otherwise white or cream.

The best varieties for the home gardener for December to January planting are White Plume and Gilt Edge Golden. For winter growing Solid White is best.

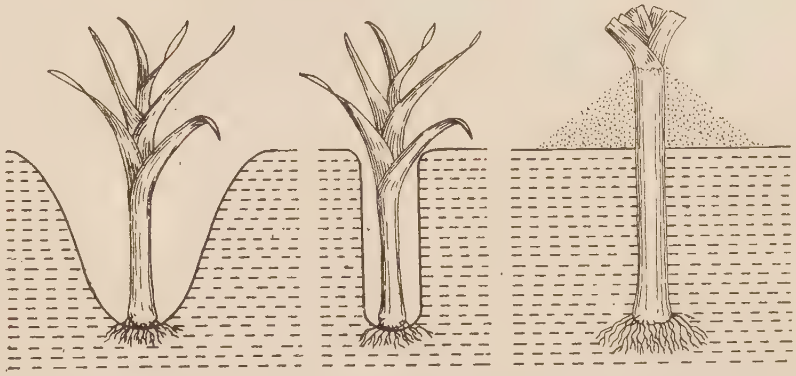
## Celeriac

Celeriac is a member of the celery family and has a large turnip-like root, which is the portion of the plant that is eaten. The roots are trimmed, washed, and boiled without salt or other flavouring until quite tender. They may be pared, sliced, and served with white sauce or left uncut to be sliced up for salads when cold. Many people use celeriac in soups and stews.

The seed may be sown outdoors from September to January, and subsequent treatment of the seedlings is similar to that given celery seedlings.

Celeriac does best in a deep, moist soil with good humus content. The seedlings should be planted on flat beds in rows 18in. apart, with 12in. between the plants. Celeriac does not require blanching.

PLANTING LEEKS



Left—Correct method of setting out a young leek plant in a trench. Middle—A leek planted in a dibble hole and watered, which is usually sufficient to settle earth around the roots. Right—Drawing up earth around the plant as it grows will blanch the stem.

## Leeks

A member of the *Allium* or onion family, the leek is a most delicious vegetable both cooked and green. It is very hardy and the seed is usually sown in seed-beds in September for replanting in the garden in December or January.

Leeks must be grown in rich ground; otherwise they are liable to become tough. The best soil is a deep, rich, friable loam, but good results may be obtained on fairly heavy ground, providing it has been well prepared. For best results the soil should be enriched with well-decayed stable or animal manure or compost and a fertiliser mixture composed of equal parts of blood and bone and superphosphate plus 5 per cent. of sulphate of potash or muriate of potash should be worked into the soil at the rate of 4oz. per square yard.

Plants can be set out 6 to 8in. apart in rows 18in. apart when the young seedlings are about the thickness of a lead pencil; transplant them into holes made 5 to 6in. deep with a dibble. The plant is dropped into the hole and watered; this is usually sufficient to settle earth around the roots. When transplanting cut back the leaves, as this helps the stem to develop, and trim the roots to within 1½in. of the bulb.

Leeks may also be planted out like celery in trenches 5 to 6in. deep. The trenches may be narrower than those used for celery, but the plants require more room and should be spaced 12in. apart when grown in this manner.

When cultivating, gradually fill in the holes and as the plants grow draw the soil up around them to cause the stems to lengthen. This will blanch the lower parts of stems of the leeks grown in drills and the whole of those grown in trenches.

Cultivate the ground well between the rows and around the plants to conserve the soil moisture and check weeds. Leeks require plenty of moisture and must be kept well watered in dry weather while the crop is growing. Be careful when hoeing or drawing up the soil not to cover the heart of the plant.

Leeks are ready for use any time after they attain suitable size, but under favourable conditions they grow to at least 1½in. in diameter with usable stalks 8 to 12in. long. Leeks will keep in perfect condition right through the winter and will not deteriorate in quality until they begin to develop seed stalks in spring.

[*Sparrow Industrial Pictures Ltd. photo.*

As tomato plants grow they should be tied to supports and the lateral growths (indicated above by the arrows) coming from the axils of the leaves should be rubbed off before they become too large. Flower trusses should not be removed.

# THE HOME GARDEN IN DECEMBER . . .

Recommended varieties are:—

**London Flag:** A good early sort and very hardy.

**Musselburgh (Scotch leek):** Best for general cropping, is hardy, and forms a longer and thicker stem than London Flag (from which it is a selection), with large but somewhat narrower leaves.

**Lyon:** Good for a late crop, as it is slow to run to seed in spring and grows to a very large size.

## Parsnips

Parsnips require a long growing season, and although they can be planted in December and January in most northern districts, the only variety that is likely to succeed from a late sowing in districts south of Auckland is the turnip-rooted type.

Parsnips grow best on land that was heavily manured for a previous crop; the seed may be sown fairly thickly ½in. deep in drills 18in. apart in soil that has been worked down to a fine tilth. Later the plants should be thinned to 4 to 6in. apart.

The best variety of parsnip is Hollow Crown, but the turnip-rooted parsnip matures quickly and is good for shallow soils. It is of first-class flavour and well worth a trial.

## Swedes

Swedes can be sown in northern districts from September to February, but October and November are perhaps the best months for southern districts. They succeed best under cool, moist conditions with neither dry nor very wet periods. They should not receive a check while growing, as this may cause them to become woody and tasteless. Late sowings when mature may be stored and used throughout winter and spring.

The ground must be in good condition, and land that has been heavily manured for a preceding crop is well adapted for the growing of swedes. If manuring is necessary, equal parts of superphosphate and blood and bone broadcast over the area at the rate of ¼lb. per square yard and raked in when preparing the ground is satisfactory. A good dressing of wood ashes applied at the same time will also benefit the crop. Sow the seed ½in. deep in rows 12 to 15in. apart and later thin the plants to 6 to 8in. apart in the rows.

**Recommended varieties** are Laing's Garden and Superlative.

## Tomatoes

Over the past century the tomato (*Lycopersicum esculentum*), which is a native of South America, has become very prominent in the national diet, ousting in popularity practically all vegetables except the potato. It is grown in nearly all home gardens and is extensively cultivated commercially. Besides being eaten raw, it can be used for making soups, chutneys, sauce, and jam.

In the North Island and in the warmer parts of the South Island tomatoes may still be planted for the late crop. Plants set out now will produce their first fruits in late March and will continue to bear until killed by early-winter frosts. Late plantings should be supported, for if allowed to lie on the soil, the plants and fruit are more susceptible to blight.

Plants in this late planting, especially where potato blight is experienced, will have to be sprayed frequently with Bordeaux mixture (4oz. of bluestone and 5¼oz. of hydrated lime to 4 gallons of water) or with certified copper oxychloride mixture, to which has been added 2oz. of lead arsenate powder for the control of the tomato worm; instead of lead arsenate ½oz. of commercial D.D.T. 50 per cent. wettable powder may be used.

Where soil conditions are dry watering is necessary to maintain soil moisture. The plants should not be watered overhead if it can be avoided, as wetting the foliage not only washes off the protective spray, but may cause damage to the plant through sun scald. Irrigation is best, and thorough moistening of the soil around the plants in one application is much better than small, frequent applications.

**Recommended late varieties** are Potentate, Supreme, and Market Favourite.

## Winter Greens

During the more favourable growing periods of the year there is little difficulty in having a succession of available green vegetables, but the supply for the winter months presents a more difficult problem to most home gardeners. Although root and stored crops such as pumpkins are a good standby, a regular supply of green vegetables (which are so rich in essential vitamins) is desirable.

For southern districts December, January, and February are the preferred months for planting winter green crops. In the North Island, where the climatic conditions are much milder, the planting period can be extended to April by using earlier-maturing kinds.

Plants may be obtained from seedsmen and should be set out in a rich, deeply cultivated, well-drained soil. A fertiliser mixture containing nitrogen, phosphoric acid, and potash is advisable, and a good mixture is 10lb. of blood and bone, 3lb. of superphosphate, and ¾lb. of sulphate of potash; this should be applied along the plant rows at the rate of 8oz. to 6ft. of row. It should be thoroughly incorporated in the soil before planting to avoid possible damage to the plant roots.

Moisture is essential during dry weather and the soil should not be permitted to dry out. In districts where pests such as white butterfly are troublesome the plants should be protected by dusting or spraying them with the recommended controls such as dusting plants with commercial D.D.T. dusting powder or spraying them with commercial D.D.T. wettable powder. For a 50 per cent wettable powder use ½oz. in 4 gallons of water and for a 25 per cent powder 1oz. in 4 gallons. Applications should be made every 3 or 4 weeks, but should be discontinued 4 weeks before using the vegetables.

As a wide range of varieties are suitable for planting, the following can be chosen from; approximate maturity dates are shown in parentheses for December plantings:—

**Broccoli:** Broccoli No. 1 and St. Valentine (August and September), Broccoli No. 2 (October), and Broccoli No. 3 (October and November).

**Cauliflower:** Early London and Phenomenal Early (March and April), Phenomenal Five Months and Veitch's Autumn Giant (May and June), and Phenomenal Main Crop and Walcheren (July and August).

**Savoy cabbage:** Omskirk Early (April and May), Drumhead (May and June), and Omega (July and August).

**Kale:** Dwarf Green (March), and Tall Green (April).

**Brussels sprouts:** Scrymger's Giant and Fillbasket (April and May).

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# DAIRY PRODUCE GRADED FOR EXPORT

THE following figures showing quantities of dairy produce graded for export during September and for the 2 months ended September 30, 1949, with comparative figures for the same month and 2-monthly period of last year, have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

**BUTTER—**

| | Tons | | | Tons | |
|---|---|---|---|---|---|
| Period | Creamery | Whey | Total | Percentage Inc. or dec. | Total in store at end of mth. |
| September, 1949, .. .. | 16,183 | 273 | 16,456 | +24.572 | 17,135 |
| September, 1948 .. .. | 12,980 | 230 | 13,210 | — | 13,874 |
| Increase or decrease .. .. | +3,203 | +43 | +3,246 | — | +3,261 |
| For 2 months ended 30/9/49 | 25,142 | 379 | 25,521 | +26.567 | — |
| For 2 months ended 30/9/48 | 19,855 | 309 | 20,164 | — | — |
| Increase or decrease .. .. | +5,287 | +70 | +5,357 | — | — |

**CHEESE—**

| | Tons | | | Tons | |
|---|---|---|---|---|---|
| Period | White | Coloured | Total | Percentage Inc. or dec. | Total in store at end of mth. |
| September, 1949 .. .. | 5,533 | 1,892 | 7,425 | +15.618 | 8,495 |
| September, 1948 .. .. | 6,422 | — | 6,422 | — | 7,821 |
| Increase or decrease .. .. | —889 | +1,892 | +1,003 | — | +674 |
| For 2 months ended 30/9/49 | 6,927 | 1,982 | 8,909 | +16.579 | — |
| For 2 months ended 30/9/48 | 7,642 | — | 7,642 | — | — |
| Increase or decrease .. .. | —715 | +1,982 | +1,267 | — | — |

If these figures are converted into butterfat equivalent, there is an increase of 25.086 per cent. in butterfat graded for the 2 months as compared with the corresponding period of the preceding season. It should be noted that the above figures refer only to butter and cheese graded for export, and that owing to diversions which may take place from time to time, they are not necessarily a true indication of production trends.

# Review of Farm Production Drive by Mr. F. P. Walsh

"SUFFICIENT real evidence is now available to show that New Zealand's farming economy is well advanced into a period of post-war expansion," said Mr. F. P. Walsh, Chairman of the Aid for Britain National Council and of the Farm Production Committee, to "The New Zealand Journal of Agriculture" recently. "The expansion now well under way is founded primarily upon a well-laid basis of security, a basis determined and built up largely by our farmers themselves, by their leaders, and by their organisations.

[*Spencer Digby photo.*

Mr. F. P. Walsh.

"THIS expansion is consistent with, and runs parallel to, the recent long-term agreements for the supply of greater quantities of food to the people of Britain.

"The background to our present success lies very deep. It consists in part of long years of solid research by our agricultural scientists, whose work today is studied in every advanced country in the world, and in part of a commendable readiness by the farmers of this country to apply the results of that research. First and foremost, the Department of Agriculture has built up a scientific and extension service to farmers which has won their regard and wholehearted support. Their Extension, Animal Research, Livestock, Dairy, and Horticulture Divisions are staffed with first-class scientists and practical men who, among other attainments, have placed New Zealand's methods of grassland farming and livestock management foremost in the world.

"With this Department's work has gone brilliant research by the Soil Survey, Plant Research, and Plant Chemistry sections of the Department of Scientific and Industrial Research and by the Wheat Research Institute. Practical application of scientific advances has been given wider scope through the teaching work of Massey and Canterbury Agricultural Colleges. An outstanding basis for an expansionist programme had been well laid over many years.

## The Second Stage

"The second period of background development," said Mr. Walsh, "began with the inception of the guaranteed price to our dairy farmers. Insecurity and the constant threat of disastrously low prices have always hung close over the heads of the world's food producers. The guaranteed price was a long step toward security, taken after full discussion with the farmers, and is now accepted as a corner stone of progress in the dairy industry.

"While our fighting men were overseas defending our liberties the prospect of inflation loomed, with ever-mounting costs threatening to create a top-heavy structure which would crash in ruins as did the farming structure after the last war. An organised defence against this new threat brought every section of our community into a new fight, on the home front. A programme to bring the threat under control was designed, a programme which reached into every corner of our country and touched every individual. As the Prime Minister said in 1942, 'Social security implies much more than a system of monetary benefits. It implies an order of society in which every citizen—wage earner, trader, farmer, professional man, or pensioner—is safeguarded against economic fluctuations.'

## Stabilisation

"From this defensive organisation on the home front came the great 1942 stabilisation campaign, a successful fight which, besides protecting every individual in our community in the war years, succeeded in bringing our country through into the post-war period to a position of far greater stability and economic security than any other country in the world was to attain. New Zealanders travelling abroad and visitors knowing our country have no illusions on this point.

"Indeed, outside New Zealand the outcome of our stabilisation programme is considered to be so important that our methods have been held up as an example to be followed by food producers throughout the world. At the third Annual Conference of the International Federation of Agricultural Producers, an entirely independent body of the world's producers, financed entirely by voluntary subscriptions from producers' organisations, certain recommendations were considered for stimulating high levels of purchasing power, reinforced by national agricultural price stabilisation measures as prerequisites to international price stability. This Annual Conference, consisting of some 150 farmers from 23 countries, including the United States, Great Britain, and other world powers, an essential qualification for membership of which is that any national farm or co-operative organisation must 'demonstrate that they are free and independent of Governments,' produced certain unanimous recommendations for forwarding to the November, 1949, Fifth World Food and Agriculture Organization for their consideration as practical methods of meeting producers' problems. Among these, as quoted in the I.F.A.P. Bulletin Vol. 1, No. 5 for June-July, 1949, were certain measures agreed as basic to expanding international trade in agricultural products at stable prices, including:—

'(d) where practicable, suitable international adaptation of the price stabilisation programs of producers, **such as exist in Australia and New Zealand,** which accumulate financial reserves in periods of high prices to supplement income of producers in periods of low prices.'

"No better endorsement of the success of our country's stabilisation policy could be envisaged. To have a responsible international body of farmers, with a full knowledge of international farming problems, hold up our farm stabilisation success as a standard for adoption throughout the world gives the measure of the great boon this policy has been to our producers.

"For our farmers this finely conceived and admirably administered scheme, devised and carried out with the full consent and co-operation of the producers' representatives on their statutory boards, has meant that they came out into the clear light of post-war opportunity with land prices at a new level of moderation, material costs kept within reason, labour costs saved from runaway levels, and finally pool accounts built up for the farmers' own use and protection, sufficient to meet the threat of falling overseas returns and to guarantee the maintenance of farmers' standards.

"Thus moderation and restraint combined with foresight brought our farmers to the post-war years in a position of stability prepared to move fast into maximum expansion.

## Recent Background

"With the threat of collapse in our principal market in Britain," said Mr. Walsh, "came the setting up in 1947 of our Aid for Britain National Council, which has played a most valuable part in stimulating our food production to meet the crisis. The members of this council, representing every interest in our community, farming, commercial, manufacturing, and labouring, have worked together in a notable spirit of comradeship which is both a credit to the individual members and a most important guide to what can be achieved in a truly national spirit in our country's future. Shortages delaying production were tackled vigorously. With the co-operation of Federated Farmers vitally needed farm machinery was obtained from dollar or sterling sources, wherever the best machinery was available. Materials necessary to open up new land or fully develop existing holdings were sought out in every world market, and fencing wire, galvanised piping, fertilisers, and every farm need were kept moving to those in greatest need. Special weekend fertiliser trains to speed supplies to the farms, subsidised hay relief schemes for drought- or flood-stricken areas, and hundreds of minor problems were tackled promptly and effectively.

"Federated Farmers, the farmers' own organisation, realising the importance of machinery to the modern farmer, not only in giving greater production but in taking the drudgery out of farming, organised, in 1947-48, a Dominion wide survey of farm machinery needs, and with the assistance of the Aid for Britain National Council took the resulting requests to the Government, who speedily granted dollar funds and sterling licences to the limit of farmers' needs.

## Long-term Agreements

"By 1948," Mr. Walsh continued, "New Zealand had entered into long-term agreements with the British Government, who agreed to take, over a 7-year period, all the meat and dairy produce that our farmers could export, at regulated prices which would not vary by more than 7½ per cent. up or down annually. This bulk-purchase agreement is a first-class example of the form of action recommended by the Annual Conference of the International Federation of Agricultural Producers referred to previously, where they unanimously resolved that 'a basic method of achieving expanding international trade in agricultural products at stable prices should be intergovernmental commodity agreements.' In return for this gain the British Government asked that we should produce and export as much meat and dairy produce as we could, and our representatives agreed to aim at a 20 per cent. increase in dairy production and the export of 50,000 more tons of meat by 1955, when the agreement expires. The latest development, which this year obtained for our farmers a 7½ per cent. increase on the 1947-48 agreement prices, has already given production another grand incentive. The conclusion of this long-term agreement was another turning point in our farming history and opened the door wide to further rapid expansion.

## Farm Production Committee

"To assist the farmers in their efforts to meet these commitments the Government set up a Farm Production Committee to investigate methods of increasing production and to make recommendations to the Government. This committee consists of the Chairman of the Aid for Britain National Council, Mr. F. P. Walsh, the Director-General of the Department of Agriculture, Mr. E. J. Fawcett, the Director of Marketing, Mr. L. C. Webb, the Secretary to the Treasury, Mr. B. C. Ashwin, and the Secretary of Labour, Mr. H. L. Bockett. To assist the committee the Department of Agriculture has provided a secretariat whose exceptional work in the preparation of valuable report material has been a major factor in enabling the committee to obtain quick and effective action.

## Fertilisers

"The first result was rapid. The committee came to the Government with proposals for an immediate expansion of fertiliser supply as the key to increases. After consulting with the Dairy and Meat Boards the Government came to a quick decision providing for the financing of a new fertiliser works in Napier and looking to the building of two further works elsewhere. Already the plans for the Napier works are drawn up and building should start soon. Secondly, to cover the period until the new works could boost our fertiliser supplies, arrangements were made for large-scale imports to be subsidised so that farmers could immediately place orders for fertiliser the use of which became reasonably economic to them. This move has had an important effect, and deliveries of something like 50,000 tons of basic slag are already under way. North African rock phosphate also is in good supply, with at least four ships at present loading or en route.

## Farm Machinery

"Following the fertiliser action," said Mr. Walsh, "came further rapid action on farm machinery. Federated Farmers had taken in 1949 another full survey of needs and presented detailed requests to the Government for further imports for 1950, both from dollar and sterling areas. Realising that a good part of this machinery would be urgently needed for the 1949-50 harvest, the Farm Production Committee strongly recommended to the Government that advance arrangements be made to get in haymaking and harvesting machinery before the end of 1949. This was agreed to and this machinery, portion of the 1950 allocation, is already in part on the water. More recently the Government has announced that further large allocations covering the first half of 1950 have been agreed to, so that the machinery available in 1950, particularly from dollar sources, is likely to meet the farmers' requests almost in full once again.

"What this means in terms of mechanising our farms is clear from a brief glance to pre-war days. Prior to the war our farmers owned some 8000 farm tractors. Today they possess over 24,000. Prior to the war farm tractor imports averaged about 1000 per year. In 1945 and on to 1947 this rose to about 2000 to 3000 per year. With the impetus of the expansion plans 6000 were imported in 1948, 7000 in 1949, and as many again will come in in 1950. This must have a tremendous effect, and combined with the other farm machinery imports designed for use with the tractors will give production a wonderful fillip in the next few years.

## Farm Labour

"After farm machinery came labour. The Government's immigration plans have already brought in farm workers from the United Kingdom in useful numbers, but there is a limit to the number of farm workers we are prepared or desire to lift from Britain's own farm lands. Federated Farmers have recently given attention to obtaining skilled Dutch farm workers and arranged with the Government earlier for one hundred of these to be brought in. More recently they came to Aid for Britain to seek help in having this number doubled, and to this the Government has now agreed, so that by the time our season is properly under way 200 of these men will be engaged on our farms.

"But there is a limit to the speed at which farm labour from overseas can be fed into our farm economy, and the final answer is to draw our own workers on to the farms and to retain them there when they arrive. This depends upon better housing, better home amenities, better schools, better road access, a better and wider community life, and upon similar factors which are being steadily attended to.

## Housing

"Already," said Mr. Walsh, "the rural housing figures are showing striking changes. Before the war houses erected in rural areas averaged about a steady 1600 per year. Last year permits were issued for the erection of over 5000 houses in rural areas. With the easing of building shortages this figure will be maintained and exceeded, until our rural workers enjoy the same standards of housing, with every electrical convenience, that the city dweller now enjoys. The Government has agreed that the policy of building rental houses in rural areas will be further expanded, and the various ways in which this policy can best be applied are being studied.

## Aerial Topdressing

"The latest activity of the Farm Production Committee has been directed upon an examination of the work carried out in the aerial topdressing of our farm lands and the seeding of pastures from the air. For a year or more under the supervision of the Soil Erosion and Rivers Control Council important experiments have been carried on with the help of the Air Force. Considerable areas have been successfully topdressed at a cost which the sponsors consider economic. Indeed, commercial operators have since begun operations in several districts, spreading 2cwt. per acre at a cost of about 10s. per acre, a cost which when the normal costs of land transport, packhorse or sled haulage, extended weeks of the payment of wages, etc., are taken into account, has proved most attractive to farmers.

"Now the Farm Production Committee has had discussions with the Air Force and the Soil Erosion authorities and has asked the Government to give urgent consideration to certain recommendations which the Soil Erosion and Rivers Control Council recently placed before Cabinet.

"Aerial topdressing has already been proved to be of real value in our farming methods. If proposals at present under investigation prove feasible and economic, aerial topdressing may open a new world of prosperity to our farmers and to our Dominion.

## A New Future

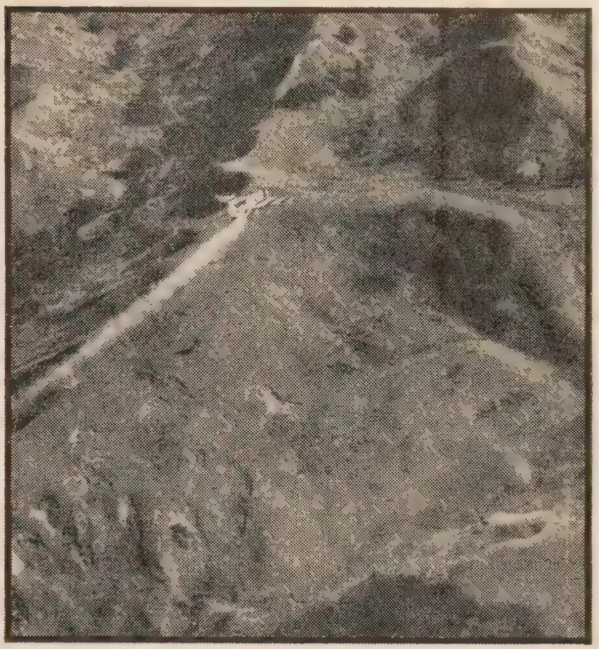
"This then is the background," said Mr. Walsh. "We have been many years preparing for this moment, but now a new future lies before us. Even today our farmers have set themselves well upon the road to the new prosperity.

"Dairy farmers last year, with the help of a favourable season, increased butterfat production by more than 10 per cent. over the previous year, resulting in increased gradings for export of 14,500 tons of butter and 12,000 tons of cheese. This year, in the first two months, these figures are already 25 per cent. up each month on the corresponding months of last year's fine effort, or 5300 tons in butter and 1250 tons in cheese. The farmers now have the fencing to subdivide and graze extensively. They have the fertiliser to spur growth. They have the machines to plant and reap winter feed, to collect speedily and cheaply the hay growing so luxuriantly. To use this extra feed they have added this year, according to the Dairy Board, 50,000 cows to their herds, which should bring our dairy cows in milk back to the highest peak reached in our dairy history, in the remarkable 1940-41 season.

"Expansion in our dairy industry is already a fact.

"Our meat producers last year sent rather fewer lambs and sheep to the works, but still showed an increase in weights killed. Beef killings were down, bringing an over-all decrease, but this may mean that farmers were stocking up for the future. Breeding ewes as at April 30, 1948, were 400,000 up on the previous year. There are indications that this increase will be repeated this year, so that our flocks are obviously being built up to enable our sheep farmers to share in the coming expansion. Beef heifers under one year of age also showed an increase in 1948 and there is reason to believe that there will be a further increase this year.

[*National Publicity Studios photo.*



[*Ministry of Works photo.*

"These are the first indicators. The expansion is under way and the impetus will grow.

## Britain and Our Farm Economy

"Whether for good or for ill our prosperity is linked with the prosperity of Britain. New Zealand must live primarily by producing and selling food. The buyers of food in the great quantities we produce must be those millions who are engaged essentially in producing specialised manufactured goods and those unable to grow enough food for their own use.

"The greatest aggregation of such people lies in Great Britain. America and other manufacturing countries with great areas of fertile land are to a large extent able to supply their own foodstuffs. Our only great market must be Britain, and thus our farm economy is inextricably locked with Britain's prosperity.

"During the war years this country marshalled its productive forces, pushed politics and sectional interests aside, and our farmers rallied inspiringly to see that Britain was given the food she needed to enable her to make the tremendous historical effort she put forward in the successful defence of democracy and freedom. Short of essential materials, with great numbers of our fittest producers overseas in the armed forces, our farmers held on grimly, worked from before daylight to beyond dusk, and succeeded in maintaining and even increasing the vital food we sent to Britain.

"That is the spirit," concluded Mr. Walsh, "which I am satisfied still lies behind our more recent production expansion. Our farmers are today building up their production not only to ensure greater security and higher standards of living for themselves, but also as their contribution to solving Britain's post-war crisis and their contribution to a peaceful solution of the world's present illnesses.

"If this spirit continues to spur our producers, and continues to unite them with other members of the community in a common cause, prosperity will follow as the inevitable reward."

# Visits to Farms and Industrial Plants by Flock House Trainees

By J. H. HITCHCOCK, Farm Training Supervisor, Flock House Farm of Instruction.

VISITS to farms specialising in stud stock or fat-lamb production and to places such as freezing works, woollen mills, and fertiliser works are considered an important phase in the training of students at Flock House Farm of Instruction, Bulls. Though the usual curriculum provides for well-balanced and thorough tuition in all phases of farming, it is felt that visits of the type described, particularly to farms, assist the trainee materially to appreciate the significance of thorough training and the results which can be achieved only through such training and by employing sound farm practices.

LECTURES on certain phases of livestock breeding and management alone cannot possibly give trainees the clear, concise picture they get through visiting the properties of successful farmers, who can demonstrate in such a practical manner on their stock.

A farmer giving a demonstration on sheep to Flock House trainees.

The Department of Agriculture is indebted to those who have received visits from Flock House parties, because it is realised that farmers have to give up 2 or 3 hours of their working time, and demonstrations have been most thorough.

During the 12 months of a trainee's course visits are made to each of the following: A stud Polled Angus herd at Turakina, a stud Hereford herd at Fern Flats, Marton, a stud Jersey herd at Parewanui, a stud Romney flock at Leedstown, Marton, a stud Southdown flock at Upper Tutaenui, Marton, a fat-lamb farm at Greatford, the Feilding freezing works, the wool stores and the wool sale at Wanganui, the woollen mills at Wanganui, the fertiliser works at Wanganui, the Marton A. and P. show, and the Rangitikei Co-operative Dairy Company's factory at Bulls.

It will be realised that during the 12 months' course a trainee sees a great variety of farming and associated activities in addition to those connected with instructional work actually at Flock House.

## Flock House Curriculum

The Flock House curriculum is on practical lines, the fundamentals of agriculture being covered as fully as possible during the 12 months. Included in the training are subjects such as dairy cattle management, pasture management, flock- and fat-lamb production, pig management, land development (including ploughing, cultivation, and all activities pertaining to pasture and crop establishment), fencing, farm carpentry, horticulture, poultry management, and apiary work.

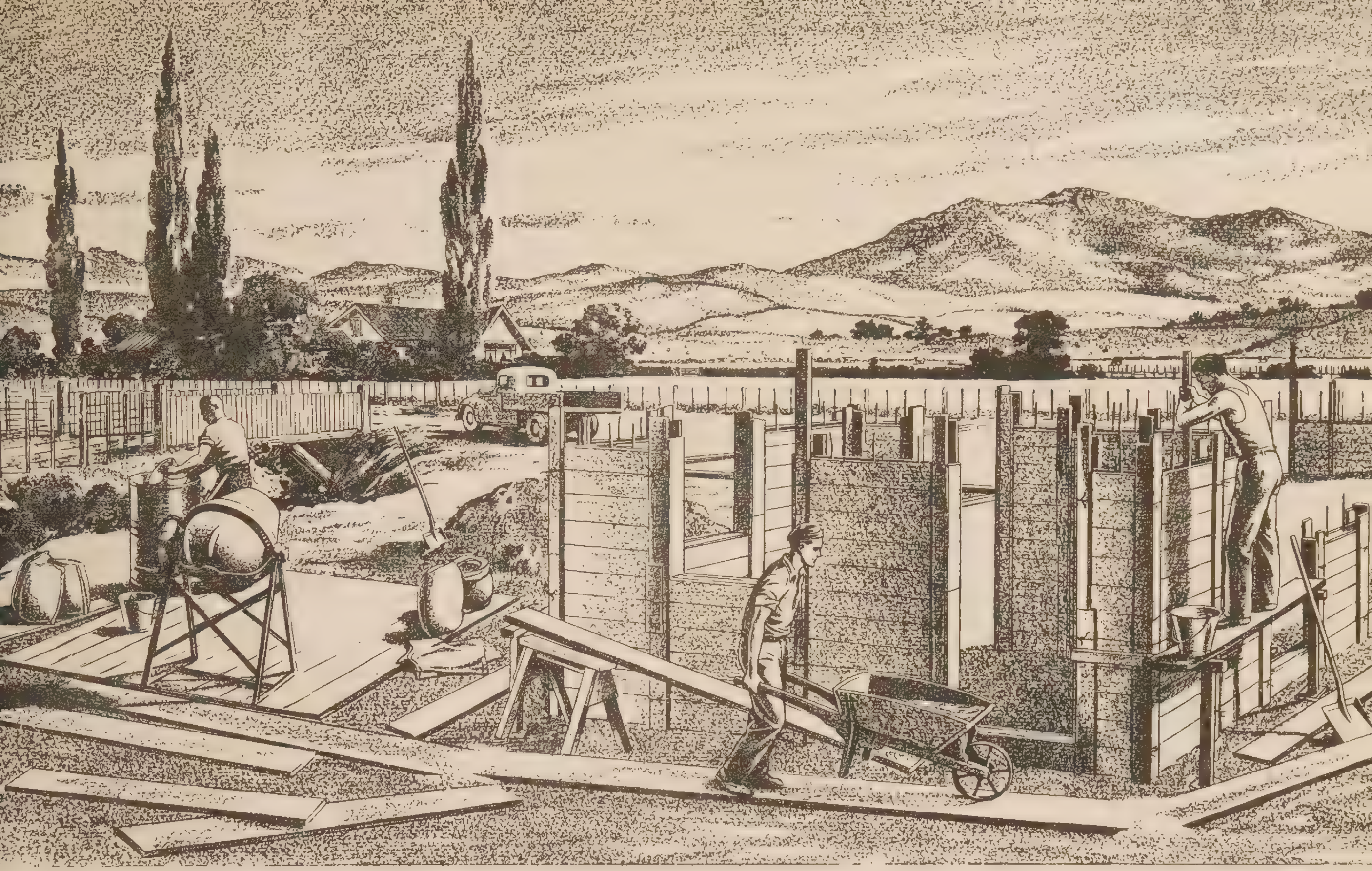
Courses at Flock House are open to youths from any part of New Zealand, the only qualifications being that the prospective trainee should be between 15 and 18, of good physique, and keen to learn, and that he intends to make some branch of farming his vocation.

## Application for Enrolment

The only cost to parents is an outfit of clothes, which is not extensive—only what a youth would require if engaged in farm work. Full details of the Flock House course are available from Flock House or any office of the Department of Agriculture. Applications for enrolment at Flock House should be made to the Director, Extension Division, Department of Agriculture, P.O. Box 3004, Wellington.

Courses at Flock House begin in the middle of January, May, and August, when approximately 15 trainees are admitted for their 12 months' tuition.

HEADING PHOTOGRAPH: The accommodation buildings at Flock House.



# The Preparation of Concrete for Structural Use

By H. W. T. EGGERS, Engineer,
Department of Agriculture, Wellington.

CONCRETE as a construction material is easily made and, having a high degree of workability, can be used in such a variety of ways that its use on the farm provides a means of construction that is invaluable to the farmer. Its properties make it an ideal material for every phase of farm construction. This article, the first of a series which aims at giving the farmer a better understanding of concrete so that he will be able to use it to best advantage, deals with the properties of concrete and methods of working it. Later articles will discuss reinforcement and forms, concrete bricks, pipes, and posts, concrete for foundations, yards, paths, retaining walls, and dams, and general uses of cement and concrete.

TO obtain the most effective use from any material a thorough understanding of the properties of that material is necessary. Construction in wood, metal, concrete, or any other material differs greatly and depends entirely on the properties of the material used.

Wood, being relatively soft, can be worked entirely by hand tools, and structures can be built in timber without any mechanical aids. Metal, however, cannot be easily worked without mechanical aids, and structures in metal require the use of machine tools to cut, drill, and shape the sections for fabrication.

The design of structures also depends on the properties of the material used. Timber, having a much lower tensile strength than steel, must be used in larger sections to carry an equivalent load in structural work.

The difference between tensile and compressive strength of steel makes it equally suitable for use for either type of stressing, provided suitable sections are used in each case, but the same difference with concrete makes it more suitable for compressive than tensile stressing. Concrete, as a structural material, is worked and formed in a plastic state and can therefore be moulded to any shape required. When the chemical action that produces hardening is complete the moulds or forms are stripped off, leaving a solid material with the qualities of stone and possessing properties which will be described later in this article.

## Composition of Concrete

Concrete is made by mixing cement and an aggregate composed of hard inert particles of varying size, such as a combination of sand or broken stone screenings, with gravel, broken stone, cinders, broken brick, or other material and reducing the mixture to a plastic condition by mixing it with water.

Compressive strength is generally accepted as the principal measure of the quality of concrete, and with a mixture of substances depending on chemical action to form the final product it will be readily understood that several factors will influence the quality and characteristics of that product.

The most important of these factors are:—

1. The proportions of mix of cement and aggregates,
2. The nature of aggregates and grading,
3. The water-cement ratio, and
4. The type of cement.

# THE PREPARATION OF CONCRETE . . .

### Proportions of Mix

The proportions of mix of cement and aggregate are usually designed for a particular condition, the general method for farm work being arbitrary selection based on experience and common practice, such as 1 part by volume of cement, 2 parts of sand, and 4 parts of stone (referred to as a 1:2:4 mix). Though this method is uneconomical and does not give the best results with a given aggregate, it is quite satisfactory for all normal farm concrete work.

### Nature of Aggregates

Because the nature of aggregates affects the strength of concrete considerably, the particles of all materials must be sound and strong with no flakiness. As the fine materials, including the cement, enter more or less into the voids of the coarse aggregate, materials must be suitably graded to occupy these voids and be clean and absolutely free from organic impurities.

The strength of concrete depends on the bonding together of the particles and the solidarity or density of the mixture. The strength increases with the quantity of cement in a unit volume, with the decrease in the quantity of mixing water, with the density of the concrete, and with the size of the coarsest aggregate.

Unless voids in the aggregate can be completely filled by particles of less size, density is reduced and the concrete is weaker in proportion to the reduction in density.

Angular aggregates such as broken stone produce stronger concrete than rounded gravel. Specially-graded mixtures of aggregates produce concrete of higher strength. Strength is decreased by an excess of sand over that required to fill the voids in the stone and give sufficient workability.

These points can be applied to the choice of aggregate; for example, if beach sand is available, it is preferable to obtain it from below high-water mark, as any wind-blown sand available from, say, sand dunes has not the same angular particles as freshly-deposited sand.

### Water-cement Ratio

The importance of the water-cement ratio depends on the principle that the strength of the concrete with given aggregates and cement bears a direct relation to the ratio of the volume of water to the volume of cement.

The smaller the ratio of the volume of water to the volume of cement, as long as the mix is workable, the higher is the strength of the resulting concrete. Therefore, the reduction of the mix to a plastic condition by the addition of water should be carried only as far as necessary to produce reasonable workability.

The consistency to be used will depend on the character of the structure. Medium or quaking concrete is adapted for ordinary mass concrete such as foundations, heavy walls, large arches, piers, and abutments. Mushy concrete is suitable for rubble concrete and reinforced concrete such as that used for thin building walls, columns, floors, conduits, water troughs, and tanks. Dry concrete may be used in dry locations for mass foundations which must withstand severe compressive strain within a month after placing, provided it is carefully spread in layers not more than 6in. thick and is well rammed.

A medium or quaking mixture is of a tenacious, jellylike consistency which shakes on ramming. A "mushy" mixture will settle when dumped in a pile, and will flow very sluggishly into the form or round the reinforcing bars. A dry mixture has the consistency of damp earth.

**The proportion of water in the mix is of vital importance, a very wet mix being much weaker than a dry or mushy one.**

For farm concreting operations mixing is usually carried out in small batches, and uniformity of mix is difficult to obtain. An easy method of testing each batch for uniformity is known as the "slump test," which will be described fully in a later article in this series.

### Types of Cement

The type of cement used does not affect the quality as much as the characteristics of the concrete. Normal cement used for practically all purposes is known as Portland cement. Other cements obtainable are:—

**Waterproofed cement,** for use where a waterproof or water-repellent concrete or mortar is particularly desirable.

**High-early-strength cement** for use where high-strength concrete is required in 1 or 2 days.

**Plastic cement,** for use where a particularly workable and fat mortar or concrete is desired, such as for masonry work.

**White cement,** for use in architectural or ornamental work.

**Natural cement,** for use as a common mortar for brick or stone work.

A knowledge of Portland cement will help in the understanding of its behaviour in the making of concrete.

## Chemical Action of Cement

Portland cement is made from a mixture of about 80 per cent. of carbonate of lime (limestone, chalk, or marl) with about 20 per cent. of clay in the form of clay, shale, or slag. After being intimately mixed the materials are finely ground by a wet or dry process and then calcined in kilns to a clinker. When cool the clinker is ground to a fine powder. This powder, which is the finished product, contains silica, alumina, certain metallic oxides, and some alkalis in varying proportions, depending on the raw materials used.

When the cement powder is mixed with aggregates and water chemical action takes place between the cement and water. The aggregate, which occupies most of the volume of the hardened concrete, is inert and the chemical action which results in the hardening of the cement paste binds all into a homogeneous mass.

This chemical process, called hydration, causes the generation of large quantities of heat, rapidly at first and gradually decreasing as the curing of the concrete takes place.

As cement depends on water to bring about its chemical change, normal atmospheric moisture will cause the change to take place with stored cement. For this reason it is essential to keep cement dry up to the time of use. Cement which has partially set in the bags has lost a considerable part of its cementing properties and concrete made with recrushed, lumpy, or hardened cement will be a failure.

Similarly the remixing of mortar or concrete after the setting action has started is extremely detrimental to the final soundness; by breaking up and retarding the consolidation of the elements pockets are produced where moisture cannot reach entirely, preventing completion of chemical action, that is, completion of hardening.

## Properties of Concrete

The properties of any material used for construction are the deciding factor in the choice of application of that material to construction.

The properties of concrete for consideration as a construction material are:—

1. Strength—compressive, tensile, and shear.
2. Watertightness.
3. Immunity against fire.
4. Workability.

### Strength

**The compressive strength** of concrete is very high and, being dependent on the type of aggregates used and the proportion of mix of aggregates and cement, can be regulated to suit the requirements of the particular construction.

Table 1 gives the compressive strength of different mixtures of concrete in pounds per square inch 28 days after use. From this table it is apparent that with a weak mixture of 1 part of cement to 9 parts of aggregate of sand and soft cinders a strength of 400lb. is obtained, as compared with a strength of 3300lb. when 1 part of cement to 3 parts of aggregate of sand and hard granite rock are used.

**The tensile strength** of concrete is of less importance than the crushing or compressive strength, as the former is seldom relied on and any members with tensile stressing are built with steel reinforcing placed in the tensile

**TABLE 1—COMPRESSIVE STRENGTH IN LB. PER SQ. IN. OF DIFFERENT MIXTURES OF CONCRETE 28 DAYS AFTER LAYING**

| Aggregate | Proportions by parts | | | | |
|---|---|---|---|---|---|
| | 1:1:2 | 1:1½:3 | 1:2:4 | 1:2½:5 | 1:3:6 |
| Granite or trap rock .. .. .. .. | 3,300 | 2,800 | 2,200 | 1,800 | 1,400 |
| Gravel, hard limestone, and hard sandstone | 3,000 | 2,500 | 2,000 | 1,600 | 1,300 |
| Soft limestone and sandstone .. .. .. | 2,200 | 1,800 | 1,500 | 1,200 | 1,000 |
| Cinders .. .. .. .. .. .. | 800 | 700 | 600 | 500 | 400 |

part. The true tensile strength is about 10 per cent. of the compressive strength.

**Shear strength:** The strength of concrete in direct shear is relatively high, as distinct from indirect shear such as in a beam with diagonal tension where the concrete may break with a shearing stress equal to a much lower value.

Direct shear strength is from 50 to 60 per cent. of the compressive strength, whereas an indirect shear equal to 5 to 10 per cent. may cause fracture.

### Watertightness

Concrete can be made practically impervious to water by proper proportioning and mixing and placing. Leakage through concrete walls is usually caused by poor workmanship and occurs at the joints between two successive days' work and through cracks caused by contraction. New concrete may be bonded to old by wetting the old surface, plastering it with neat cement mortar, and then placing the concrete before the neat cement has set. Contraction cracks are almost impossible to prevent entirely, though a sufficient amount of reinforcement may reduce their width to permit only seepage of water.

To get the best results either a quaking or mushy consistency should be used, the concrete must be placed carefully to leave no visible stone pockets, and the entire structure should be made without joints and preferably in one continuous operation. A very wet mix will cause porous concrete.

The best waterproofing agent is an additional proportion of cement in the mix. For maximum watertightness mortar and concrete may require more fine material than would be used for maximum strength, though too much fineness will give porous concrete unless the cement content is increased. Gravel produces more watertight concrete than broken stone under similar conditions.

Patented compounds are available for producing watertight concrete, but under most conditions results as good may be obtained for less cost by increasing the percentage of cement in the mix.

Membrane waterproofing, consisting of asphalt or tar with layers of felt or tarred paper, may be advisable in certain cases.

### Immunity Against Fire

The immunity of concrete against fire is apparent from its non-combustible nature and its low value of heat conductivity. Being non-combustible, it can be used where fire risk is great (for example, for petrol stores) and its low heat conductivity makes it useful for the protection of combustible material from a source of heat.

### Workability

Any material used for construction must be readily workable. Concrete is particularly suited in this respect, as it is worked in a plastic state, the particular properties of the finished product being brought about by chemical change.

## Effect of Oil

Mineral oils applied externally do not injure concrete. Animal fats and vegetable oils, however, tend to disintegrate concrete unless it has thoroughly hardened. Concrete resists the attack of diluted acids after it has thoroughly hardened, but is disintegrated by strong acids. Green concrete is injured by manure, but is not affected after it has thoroughly hardened. Electrolysis injures concrete under certain conditions, and electric currents should be prevented from reaching it.

Sea water attacks cement and disintegrates concrete unless the concrete is made with the very best materials under the best conditions. Deleterious action is greatly accelerated by frost. To prevent serious damage the concrete must be made with a rich mix (not leaner than 1:2:4) and with exceptionally-good, well-graded aggregates and must be allowed to harden thoroughly before it is touched by sea water.

Though there is no essential difference in the strength of concrete mixed with fresh or sea water, the latter tends to retard the setting slightly and may increase the tendency of the reinforcement to rust. Fresh water should be used where possible and in every case mixing water must be clean.

After the setting and curing period concrete continues to harden and does not attain full strength until nearly a year old. Table 2 shows the strength of ordinary Portland cement concrete at various ages.

## Methods of Working Concrete

The methods of working concrete should be arranged so that they interfere in no way with the chemical action which forms the finished concrete.

If concrete is to be used as a construction material, the nature of the structure will be the deciding factor in the proportion of mix, the choice of aggregate, and the method of moulding the plastic concrete. The proportion of the mix will vary with the strength requirements of the structure. The choice of aggregate will depend on whether the finished structure is moulded in thin or thick sections and whether the concrete is reinforced or mass.

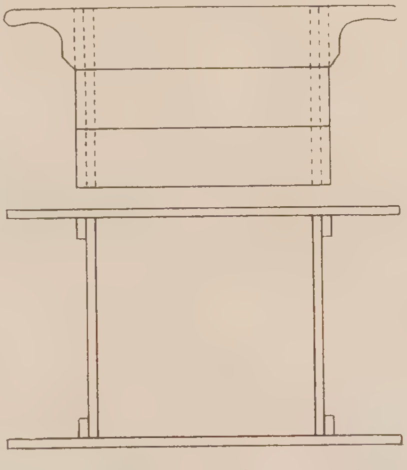


Fig.' 1—Construction of a measuring box. The cubic capacity will depend on the volume of materials being mixed at the one time. Upper—Elevation. Lower—Plan.

**TABLE 2—STRENGTH OF ORDINARY PORTLAND CEMENT CONCRETE AT VARIOUS AGES**

**(1 : 2 : 4 Laboratory Test Cubes)**

| Age | Compressive strength lb./sq. in. | Approximate percentage of hardness |
|---|---|---|
| 28 days | 4,000 | 60 |
| 3 months | 5,700 | 85 |
| 6 months | 6,300 | 95 |
| 1 year | 6,600 | 100 |

The method of moulding the plastic concrete will depend on whether the structure is above or below ground and whether an arch, a slab, or unit articles such as blocks, fence posts, troughs, etc., are being made. This also influences the state of plasticity in which the moulding can be carried out. Details of the best mixes for specified usage will be given in later articles in this series.

Whatever the construction and the corresponding variation of mix, aggregate, and method of moulding, the method of working the concrete is the same in every case and may be done either by hand or by machine.

As the hardening of the plastic mixture is dependent on chemical action, the mixed ingredients must be uniformly distributed to ensure that action is uniform throughout, and this can be accomplished only by adequate mixing.

### Hand Mixing

Hand mixing should preferably be carried out on an even, non-absorbent surface. A concrete floor or slab offers an ideal surface, but if there is not one available, a surface of timber can be constructed. The area chosen for mixing must be twice the size of the area required to accommodate one mix.

If up to ¾ cub. yd. of materials is being mixed at one time, an area of not less than 12ft. x 12ft. should be provided; for smaller quantities the area can be proportionately less. Straight planks 1½in. or 2in. thick should be laid side by side either on levelled ground or on 3in. x 4in. bearer timbers so that a firm, reasonably level surface is obtained. A shovelful of sand should be scraped over the boards to fill up any spaces between their edges.

As the proportioning of aggregates for all farm concreting operations will probably be done by volume, one or more measuring boxes will be necessary. The size of the boxes will depend on the volume of materials being mixed at any one time. If 1 cub. yd. is being mixed and the mix is 1:2:4, one box about 1/6 cub. yd. in volume would suffice. If a large amount of mixing is to be done, two boxes can be provided, one for the cement and sand and the other for the coarse aggregate. In this case the volume of the box for the aggregate would be four times the volume of the box for the cement and sand or 2/3 cub. yd. Fig. 1 shows the general construction of a measuring box.

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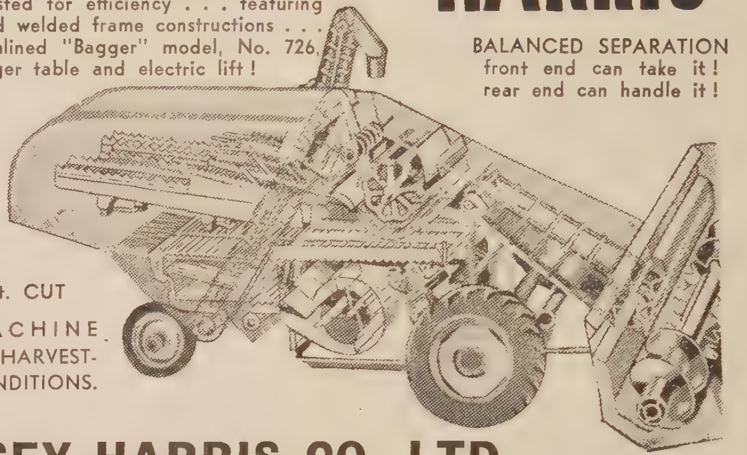

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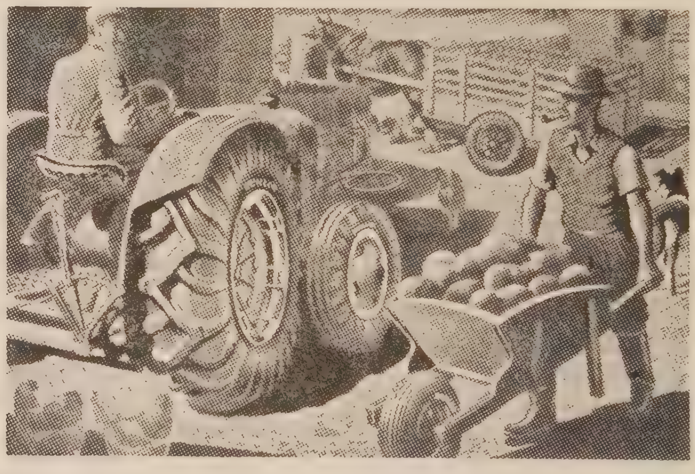

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# THE PREPARATION OF CONCRETE FOR STRUCTURAL USE

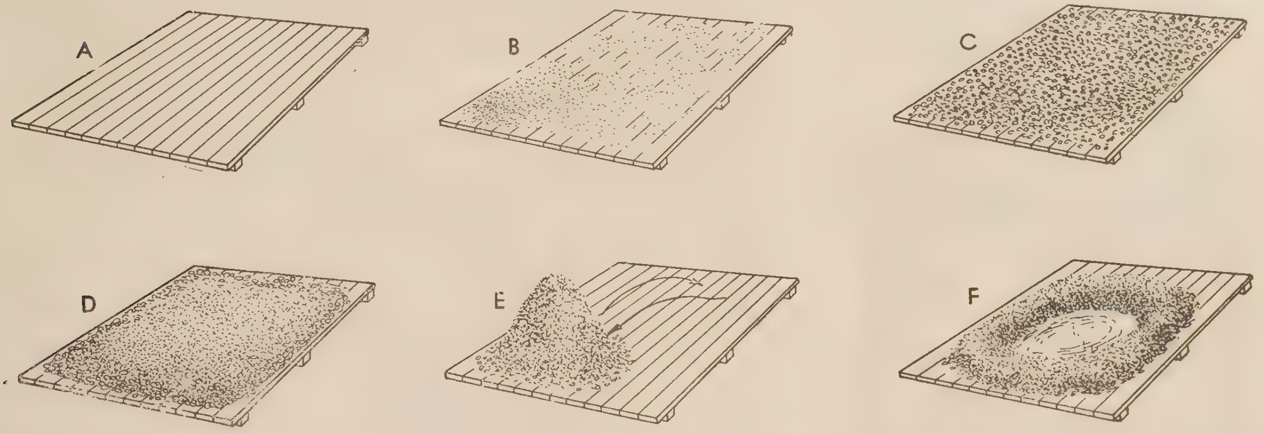


Fig. 2—Stages in mixing concrete by hand. A—Flat surface made of timber. A concrete floor or slab can also be used. B—Sand scraped over the surface. C—Coarse aggregate spread over the surface. D—Sand and then cement spread over the aggregate. E—Ingredients stacked in a heap. The heap is worked to the other end of the board and then back to its original position. F—The mixture is spread out and a hollow made in the centre. The water is then added and the mixture mixed from the outside in to the centre.

The first step in hand mixing is to measure the coarse aggregate. If one small measuring box is being used and the mix is 1:2:4, the box is filled level with the top and emptied four times. If two boxes are used, the larger is filled level with the top only once and emptied. The boxes are placed on the mixing surface, filled more than level with the top, and the surplus brushed off with a straightedge. The box is emptied by lifting and the coarse aggregate spread out over the mixing surface.

Next, measure the fine aggregate, using the small box in exactly the same way as for the large aggregate and filling and emptying twice only. Spread the fine aggregate over the coarse. Measure the cement, using the small box once only. Spread the cement over the sand.

These operations will result in a bed of gravel, sand, and cement spread over the mixing surface. This bed is then shovelled into a heap to one side of the mixing surface. The heap is moved by shovelling to the other side of the surface and back again to its original position. The knack of shovelling the dry mix to ensure a uniform distribution of all materials is soon acquired, each shovelful being spread over the heap and not dumped.

**As the success of the concrete depends on a thoroughly-uniform distribution of the materials, they should be turned over in the manner described until there is no doubt about their being thoroughly mixed.**

When the mixture has been turned over at least twice the heap is again spread over the mixing surface and a ridge scraped round the edge, leaving a hollow in the middle. The water is poured into the hollow, and the ridge gradually pushed inward, the mixture being mixed all the time so that none of it remains dry. When the mix is all moistened it is turned over and puddled and sufficient water added to reduce the whole mix to the degree of plasticity required for the work. Fig. 2 shows the various stages of hand mixing.

A square-nose, long-handled (Cornish) shovel is the most suitable for mixing concrete, and should be used in the direction of the planks when mixing on a board surface.

### Machine Mixing

Machine-mixing procedure differs from that of hand mixing because, owing to the bowl of the machine being wet from the previous mix, the ingredients cannot be mixed dry; if the materials were put into the bowl dry, they would cake on the beaters and bowl.

The mixing procedure with a mixer, whether hand or power operated, is begun by placing about two-thirds of the water required for the completed mix in the mixer and then a measured quantity of cement. A power-driven mixer will be revolving all the time these operations are being carried out, but a hand mixer must be given a few turns to mix the cement and water thoroughly. Next, add about two-thirds the measured quantity of mixed aggregate and mix until all is moistened. The remainder of the aggregate can then be added and sufficient water added a little at a time to reduce the mix to the plasticity required. When all ingredients have been put into the mixer mixing should be continued until the consistency of the mix is uniform throughout. The mix can then be deposited in a wheelbarrow for disposal, and the operation repeated.

As a small mixer will be used for most farm concreting operations, measuring boxes are not necessary, the shovel being the most convenient measuring medium. The average 3 cub. ft. mixer will hold comfortably a mix measured by the shovel. A mix of, say, 1:2:4 will be 1 shovelful of cement, 2 of sand, and 4 of gravel, a total of 7 shovelfuls. Table 3 sets out units of weights and measures that are helpful in calculating quantities of material to be mixed.

### TABLE 3—WEIGHTS AND MEASURES

1 cub. yd. = 27 cub. ft.
1 ton of cement = 24 cub. ft.
= 18 hessian or 24 paper bags
94lb. of cement = 1 cub. ft.

| | |
|---|---|
| 1 hessian bag of cement contains | $1\frac{1}{3}$ cub. ft. |
| 1 paper bag of cement contains | 1 cub. ft. |
| 1 hessian bag of cement contains | $1\frac{1}{8}$ bushels |
| 1 hessian bag of cement weighs | 125lb. |
| 1 paper bag of cement weighs | 94lb. |

4 hessian bags of cement will mix about 1 cub. yd. of concrete of 1:2:4 mix.

Care should be taken to see that all shovelfuls are equally piled. Cement will pile higher than gravel or sand, and if it is not measured exactly, it may cause the mix to be richer than intended.

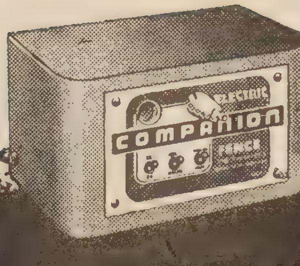
## Handling Concrete

Because concrete is plastic, the ingredients of the mix can become badly disposed by vibration. If wet concrete is conveyed in a wheelbarrow, the vibration consolidates the mix, driving off the water, and if the carrying is continued for any length of time, the larger stones and gravel will tend to sink to the bottom. If concrete must be transported in a wheelbarrow, it should be remixed in the barrow before placing.

This effect of vibration on concrete is used to consolidate a mix after placing it in moulds, as in the manufacture of concrete posts. For this application, however, the vibration is controlled and is not carried to the point where redisposition of the particles begins to take place, but is used solely for consolidation and to release trapped air.

The process of tamping or spading concrete placed in forms produces the same effect as vibrating and for this reason concrete can be overtamped. Tamping is necessary with the use of forms to ensure that no gravel pockets are left and to remove all coarse material from the outside surface to produce a clean finish.

When concrete is run down a chute into forms the heavy aggregate tends



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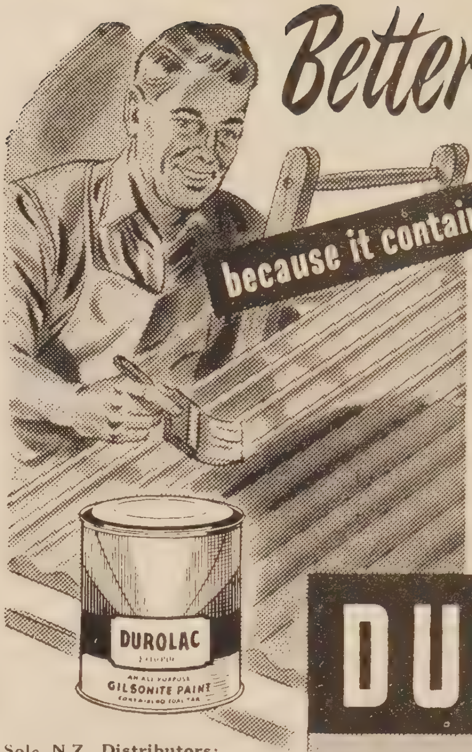

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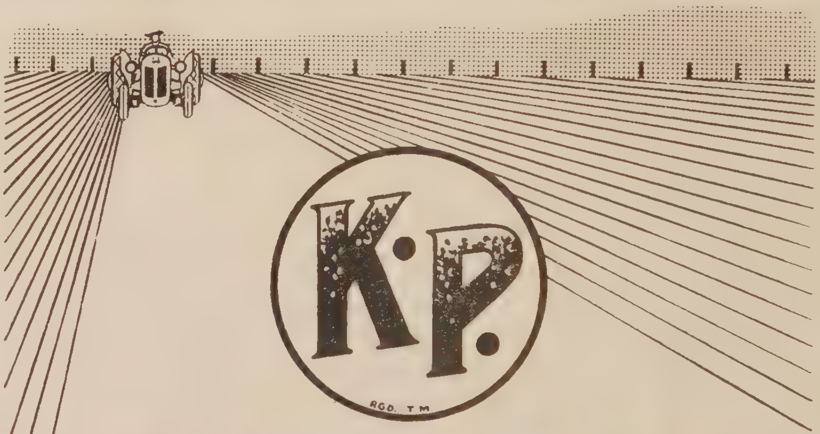

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to separate out and a quantity of pebbles may arrive in the forms ahead of the more even mix. This is not detrimental where the previous mix is still plastic, but if allowed to occur on a previous mix already hardened, it will result in a gravel pocket and poor bonding. The previous application of a bonding slurry of neat cement and water will help bonding, but will not remove the gravel pocket, which must be done by tamping.

The method of handling concrete must be arranged to suit the work. The degree of plasticity can be suited to the work, but for some work where there is external water the mix can be used dry. In the construction of a bag dam (described in the article "Establishing a Farm Water Supply System," which appeared in the February, 1949, issue of the "Journal") the dry mix is placed in bags and the creek water allowed to moisten the mix by percolation.

Dry-mix concrete, that is, a mix with a small amount of water to produce a consistency of damp earth, is used for the manufacture of concrete blocks or concrete field tiles by machine. A normal mushy mix is used for under-water concreting and is placed by means of a tremie. If under-water concrete were placed in the normal way, the cement would be washed out as the particles settled. A tremie, which consists of a length of pipe with a funnel attached, is placed with its discharge end near the bottom of the under-water mould. Concrete is then fed into the funnel and carefully placed in the mould by the tremie, the bottom of which is kept embedded in the concrete, which displaces water without the cement being washed out.

Because of the detrimental effects of regauging or remixing concrete, no more concrete should be mixed than can be used before the initial set commences. Special care is necessary in hot weather, when setting may occur in a much shorter period than under normal conditions. It is desirable that concrete should be placed within half an hour of the addition of water and that it should not be disturbed after that period. Concrete mixed some time before it is deposited should be used only if it can be remixed to a workable consistency without the addition of water; if this cannot be done, it should be discarded.

Concrete should never be placed in very cold weather, as hardening is considerably retarded as freezing point is approached.

Tables 4, 5, 6, and 7 contain information which will assist in the calculation of quantities of materials required for different concrete work. In the tables concrete is divided into two classes—No. 1, extra-strong and relatively watertight concrete; and No. 2, ordinary, good concrete.

## Curing of Concrete

Concrete attains its best results if it hardens in a warm, damp atmosphere. If it is exposed to a hot, dry atmosphere while hardening, there is danger of the water required by the cement for hardening being evaporated and possibly preventing hardening and certainly tending to produce contraction cracks.

### TABLE 4—AREA COVERED BY 1 CUB. YD. OF CONCRETE OF DIFFERENT THICKNESSES

| Thickness in. | Area covered sq. ft. | Thickness in. | Area covered sq. ft. |
|---|---|---|---|
| ⅜ | 864 | 4 | 81 |
| ½ | 648 | 4½ | 72 |
| ¾ | 432 | 6 | 54 |
| 1 | 324 | 8 | 40.5 |
| 2 | 162 | 9 | 36 |
| 3 | 108 | 12 | 27 |

### TABLE 5—QUALITY OF CONCRETE AND SIZE OF GRAVEL FOR DIFFERENT PURPOSES

| Class of work | Thickness in. | Quality of concrete | Size of graded gravel in. |
|---|---|---|---|
| Light footpaths, dairy and light shed floors, and base course for tennis courts .. .. .. | 3 to 4 | No. 2 | 1 or less |
| Cow yards, heavy shed floors, ordinary garage floors, and drives .. .. .. .. | 4 to 6 | No. 2 | 1½ or less |
| Floors, drives, etc., for extra-heavy wear .. | 4 to 6 | No. 1 | 1½ or less |
| Thick foundations and unimportant large masses such as retaining walls and thick dams (under 6ft. high) .. .. .. .. .. .. | As required | No. 2 | 3 or less |
| Thick dams over 6ft. high .. .. .. | As required | No. 1 | 3 or less |
| Reinforced inside walls and unimportant shed walls .. .. .. .. .. .. | 3 to 6 | No. 2 | ¾ or less |
| Reinforced important outside walls, cisterns, tanks, swimming pools, ponds, silos, and cellars .. .. .. .. .. .. | As required | No. 1 | ¾ or less |
| Fence posts (farm) .. .. .. .. | 4 to 8 | No. 2 | ½ or less |
| Plaster coats for paths, floors, walls, etc., top course for tennis courts, and thin troughs, stucco, rough cast, and ornaments such as sundials, fountains, seats, etc. .. .. | ½ to ¾ | No. 1 | Sand only |

### TABLE 6—QUANTITIES OF MATERIALS TO MAKE 1 CUB. YD. OF CONCRETE

| If aggregate used is graded up to | Cement (124½lb. per hessian bag; 94lb. per paper bag) lb. | Sand, moist (loose measurement) cub. ft. | Gravel or metal (loose measurement) cub. ft. | or Sand and gravel if already mixed (loose measure) cub. ft. |
|---|---|---|---|---|
| **For No. 1 concrete** | | | | |
| ⅜in. | 740 | 13½ | 24 | 27 |
| ½in. | 720 | 13 | 24 | 27 |
| ¾in. | 676 | 12 | 26 | 27 |
| 1in. | 640 | 11½ | 27 | 28 |
| 1½in. | 600 | 11 | 27 | 27¾ |
| 2in. | 580 | 10½ | 27 | 27 |
| 3in. | 560 | 10 | 26 | 27 |
| **For No. 2 concrete** | | | | |
| ⅜in. | 530 | 17 | 26 | 31 |
| ½in. | 520 | 16½ | 27 | 31 |
| ¾in. | 480 | 15½ | 28 | 31 |
| 1in. | 460 | 15 | 29 | 31 |
| 1½in. | 430 | 14 | 28 | 30 |
| 2in. | 420 | 13½ | 28 | 29½ |
| 3in. | 410 | 13 | 27 | 29½ |

### TABLE 7—QUANTITIES OF SAND AND GRAVEL TO MIX WITH 1 BAG OF CEMENT TO MAKE CONCRETE

| If aggregate used is graded up to | Quantities to mix with 1 bag of cement | | | Approx. amount of concrete cub. ft. |
|---|---|---|---|---|
| | Sand, moist (loose measure) cub. ft. | Gravel or metal (loose measure) cub. ft. | or Sand and gravel if already mixed (loose measure) cub. ft. | |
| **For No. 1 concrete (using 6 gals. of water)** | | | | |
| ⅜in. | 2¼ | 4 | 4½ | 4½ |
| ½in. | 2¼ | 4½ | 4¾ | 4¾ |
| ¾in. | 2¼ | 4¾ | 5 | 5 |
| 1in. | 2¼ | 5¼ | 5½ | 5¼ |
| 1½in. | 2¼ | 5½ | 5¾ | 5⅜ |
| 2in. | 2¼ | 5¾ | 5⅞ | 5¾ |
| 3in. | 2¼ | 5¾ | 6 | 6 |
| **For No. 2 concrete (using 8 gals. of water)** | | | | |
| ⅜in. | 4 | 6 | 7¼ | 6¼ |
| ½in. | 4 | 6½ | 7½ | 6½ |
| ¾in. | 4 | 7¼ | 8 | 7 |
| 1in. | 4 | 7¾ | 8¼ | 7¼ |
| 1½in. | 4 | 8¼ | 8½ | 7¾ |
| 2in. | 4 | 8¼ | 8¾ | 8 |
| 3in. | 4 | 8¼ | 9 | 8¼ |

NOTE: Moist sand or aggregate contains about ¼ gal. of water per cubic ft.

All cement generates heat during setting, and if this heat can be conserved in the concrete, a satisfactory means of protection against frost is produced as long as it does not cause unbalanced internal stressing. This naturally-developed heat can be conserved in newly-laid concrete by covering the concrete with a tarpaulin or other material placed not only to exclude draughts underneath, but to leave a space between the concrete and the covering.

The protection of newly-laid concrete from heat and drying winds is as vital as protection against frost, as the concrete is not hard enough at an early age to resist without cracking the stresses set up by contraction. Timber shuttering is an adequate protection if left in position for at least a week; otherwise the concrete should be kept damp for a fortnight after being laid by being covered with wet sacks, damp earth, or by frequent watering.

### Hardeners

Though several proprietary brands of concrete-waterproofing material or hardeners are available, the best means of waterproofing is by the use of additional cement and a consolidated mix. A good hardener that can be profitably applied to such work as milking shed floors or cattle yards is sodium silicate. This is not added to the concrete mix, but is applied as a solution to the surface after setting. It converts the inert lime set free from the cement during setting into silicate of lime, which is a strength-giving material, thus hardening the surface of the concrete.

## Radio Broadcasts

THE following radio talk will be given to farmers from Station 1YA Auckland at 7.15 p.m.:—

December 7—"Current Farming Problems for the Month," by J. E. Bell, Fields Superintendent, Department of Agriculture, Auckland, A. J. Kerse, Fields Instructor, Department of Agriculture, Auckland, and H. Woodyear-Smith.

Other talks are given from 1YA Auckland on Tuesdays at 12.35 p.m., 2YZ Napier on Thursdays at 12.40 p.m., 2YA Wellington on Thursdays at 12.35 p.m., and 3YA Christchurch on Mondays at 12.20 p.m.

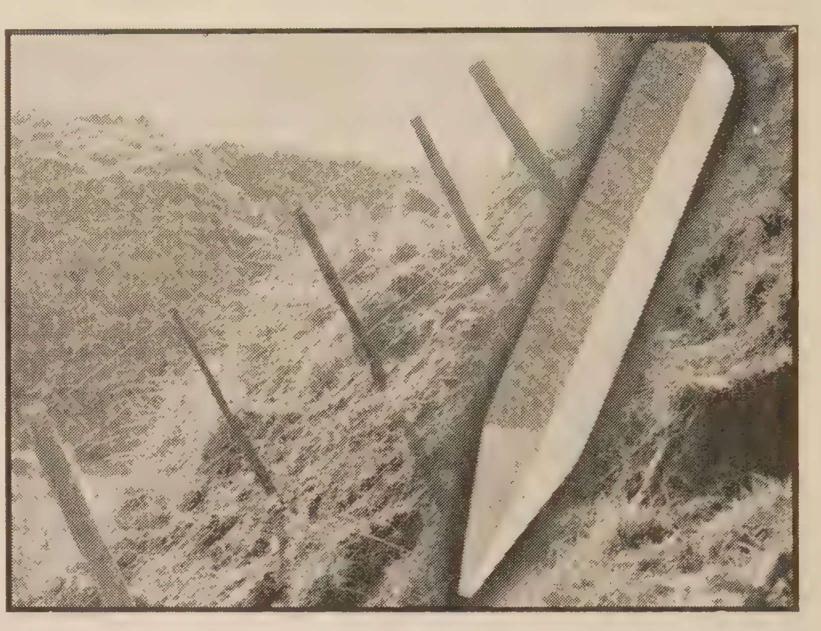
## Pig Broadcasts

UNDER the auspices of District Pig Councils broadcasts will be delivered in December as follows:—

Auckland—1YA, on December 27, "Prevention of Seasonal Pig Ailments," by S. A. Morgan, Supervisor, Waikato District Pig Council.

Napier—2YZ, on December 9, "Increasing the Profit on Second-litter Pigs," by H. T. Donaldson, Supervisor, Tairawhiti District Pig Council.

# DESTRUCTION OF SURVEY MARKS



**THE heavy cost thrown on the community by the constant removal of or the destruction of survey marks is causing concern to the Department of Lands and Survey and to the New Zealand Institute of Surveyors, of which all practising surveyors are members. It is vitally important both from a national viewpoint and in the interests of individual landholders that survey marks should be retained.**

WORK done by practising surveyors preceded all early settlement and the surveys and plans made continue to be required for an ever-increasing number of purposes. Surveys still precede the subdivision of either town lots or farms; still control all national development work; and, possibly most important, they still safeguard all titles to land.

The New Zealand system of land marking has been very carefully built up over the years and today has a world-wide reputation for accuracy. Every farmer or other land owner knows that the title to his land is guaranteed by the State, that all particulars of his boundaries are carefully recorded in the Department of Lands and Survey offices, and that, should any dispute arise, or his boundaries need redefinition, it is possible to have his corners marked out on the ground at any time. And not only marked, but reproduced in the right place. There is no guesswork about survey; the position of every survey mark is tabulated officially and recorded with reference to central fixed points—in Auckland, Mt. Eden; in the Manawatu, Mt. Stewart; and so on—and when a peg is re-established for any reason it is put back to all practical intents and purposes in the same place it was in originally.

If one or more old marks have been destroyed or removed, the surveyor must find others sufficient to check the accuracy of any new ground marking. That is why a surveyor brought in to fix a point on one property sometimes has to spend hours searching for old marks on another place, perhaps a mile down the road, which obviously leads to extra expense and often to considerable misunderstanding.

Actually the extra cost resulting from peg destruction amounts to a very considerable annual loss, much of it unnecessary. If a survey peg is moved at all, the work of replacing the peg will be difficult and expensive. The farmer who takes out a peg to place a post and then puts the peg back "in the same spot" would be better advised to leave it out of the ground; he would be far wiser not to move it in the first place, not just to please surveyors but as a matter affecting him closely. There are few occasions when it is essential to have a post in the exact position occupied by a survey peg and with a little care it is possible to place a post very close to a peg without moving it. In any case there are many necessary survey marks which are not actual boundary corners. If there is risk of a plough, mower, or heavy cattle destroying a peg, it should be driven straight down deeper into the ground.

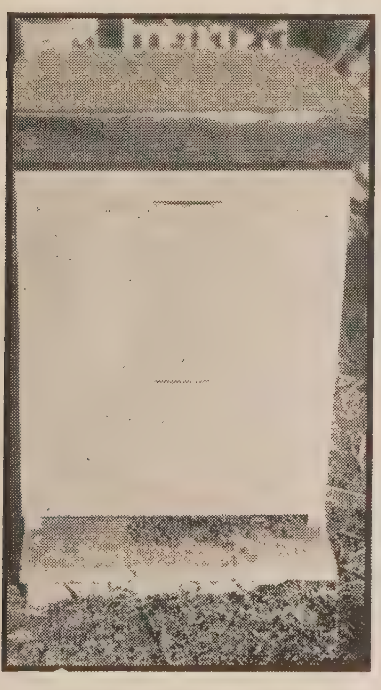
The survey marks in most general use are 3in. x 2in. or 2½in. x 2½in. totara pegs 21in. long, or 1in. diameter iron spikes or galvanised-iron tubes 24in. long. In rural areas particularly, many prominent hill tops have trigonometrical stations on them, generally made of iron tubes up to 3in. in diameter. These are part of the original framework of the whole survey system and are most important.

# Combating Wasps : Recommended Practices for Beekeepers

**FOUR years have passed since wasps of the species *Vespa germanica* were first discovered in the Waikato district. In this article C. R. Paterson, Apiary Instructor, Department of Agriculture, Hamilton, describes the experience gained in recent years in combating the wasps and recommends certain apiary practices which beekeepers must adopt to protect hives against the pest.**

SUFFICIENT time has now elapsed to enable first-hand information to be collected and for the position as to the extent wasps constitute a menace to the beekeeping industry to be reviewed. In an analysis of the exact position regarding the activity of wasps it is necessary to consider the locality in question and the incidence of infestation, or the conclusions reached may be wrong. Many beekeepers who are asked to what extent they consider wasps are harmful to beekeeping will say frankly that they have not been worried by them in the least. Others located in the same district are considerably concerned at the attention the wasps give their colonies.

What, therefore, is the reason for this difference in experience? There appears little doubt that the destruction of active nests is a very definite means of reducing the number of flying wasps in a particular district. In clean, open country nests are soon discovered, as people generally are on the alert. This means that apiaries in such areas receive very little attention. Yet apiaries only a mile or so away may have almost as many wasps as bees flying around at certain times of the year. Apiaries so affected are generally very close to large, scrub-covered gullies or weed-infested areas, and where these conditions exist it is almost impossible to locate nests. This means that nests are able to build up to maximum strength and by autumn large numbers of wasps are searching for suitable food.



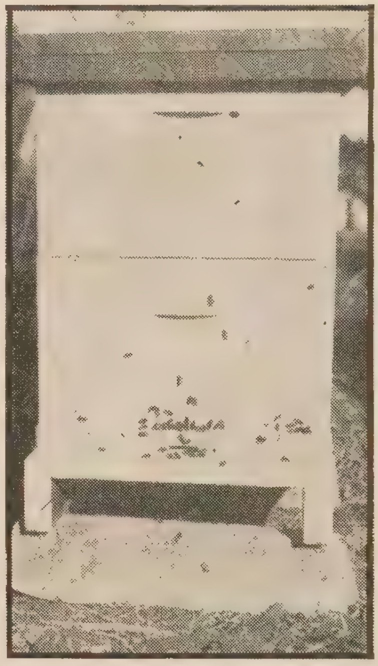
A hive with a full entrance. Note the space at left where wasps could easily get into the hive.

### How Wasps Affect Beekeepers

From January onward wasps become actively interested in sweet substances such as fruit juices, jam, and honey, and honey houses become a centre of attraction. Buildings that are considered bee proof will not keep out wasps, which have the determination and ability to force their way through openings through which a bee would never attempt to pass. Where large numbers of wasps are flying round in the honey house when honey is being extracted or, especially, when it is being packed the beekeeper is faced with a major problem.

A queen wasp of the *Vespa germanica* species, showing the distinctive markings, which are black on a bright yellow body.

With characteristic persistence wasps attack relentlessly hives which are not able to offer sufficient resistance. On many occasions it may be possible to see bees ejecting numbers of wasps, but if the beekeeper maintains a watch he will notice that wasps are continually evading the guards and gaining entrance to the hive. It is amazing how wasps hover round and, as soon as an opportunity occurs, enter the hive. Bees would have a reasonable chance of coping with wasps but for the fact that the latter appear to have a degree of intelligence which they use to good purpose. As bees form themselves into a partial cluster at night or during unsettled weather, wasps find it comparatively safe to enter hives early in the morning or late in the evening, when guards are mostly off duty, and on wet days it is possible to see wasps flying in and out of hives without encountering much opposition. Under these conditions colonies short of stores very soon find themselves on the point of starvation and, when this state has been reached, very little can be done to save the hives, except perhaps to remove them to another site.



A hive with a restricted entrance, which gives bees a reasonable chance of repelling invading wasps.

It is in the establishment of nuclei during the autumn that beekeepers are most likely to be seriously affected by wasps, if all wasp nests close to hives are not destroyed. Wasps (workers and drones) give newly-made-up colonies a great deal of attention and there have been many instances where nuclei have been wiped out.

### Beekeepers' Experiences

Checking the actual experiences of beekeepers has been somewhat difficult because of the delay in receiving reports. There is no doubt, however, that many beekeepers have lost numbers of nuclei during the past few years. In certain areas it is possible to find wasps intermingling with bees in the hives.

**A case involving the loss of approximately 34 hives last winter has been reported.**

It is believed that the apiary concerned had received the normal autumn management and about 4 combs of honey had been given to each hive as supplementary stores. An inspection of the particular apiary in April showed that wasps were flying round in large numbers and 4 hives were almost robbed out. These were not weak hives, as they still had as much as 6 combs of brood. The bees in all the other hives were on the alert; bees were right across entrances and at this particular time any invading wasp was dealt with strenuously. Besides the wasps concentrating on the weakened hives others could be seen investigating every crack in hives and lids. It was recognised that the increased activity of the bees in defending their hives would mean a serious depletion of winter stores. In this apiary wet supers had been placed out and these may have been responsible for attracting such a large force of wasps. The apiary was on the edge of a large gully in which it would be impossible to locate and destroy wasp nests.

### Suggested Methods of Control

It is unfortunate for beekeepers that it is not possible by using screens to prevent wasps from invading honey houses and beehives; wasps will crawl through a smaller opening than a bee so that a wire excluder is impracticable. Until research workers, who are now making investigations, are able to find more effective control methods the following appear to be the best precautions that can be taken:—

1. The beekeeper should encourage all occupiers of property close to the apiary to locate and destroy as many wasp nests as possible.
2. When necessary the beekeeper should destroy nests himself when they are reported.
3. Hive equipment should be kept thoroughly sound; badly-fitting lids and warped supers should be discarded.
4. A high standard of cleanliness around the apiary should be maintained; honey or odd pieces of comb should not be left about.
5. Entrance guards should be placed on hives as soon as wasps appear to be troublesome. In warm districts it may be necessary to allow further ventilation by placing an empty super on top of the hive.
6. Extracted combs should not be put out in the apiary for the bees to clean out.
7. Nuclei established in the autumn should be placed out in apiaries where wasps are not likely to be troublesome.
8. In wintering down colonies allowances should be made for additional supplies of feed honey—it is not only the amount of honey robbed by the wasps which has to be taken into account; bees themselves consume a considerable amount while continually on the alert to defend their hives.

The evidence this season has indicated that where wasps have become well established beekeepers face a definite problem. The menace can be combated only by co-operating with the public in a campaign of destruction, including a diligent search for hibernating queens and established nests.

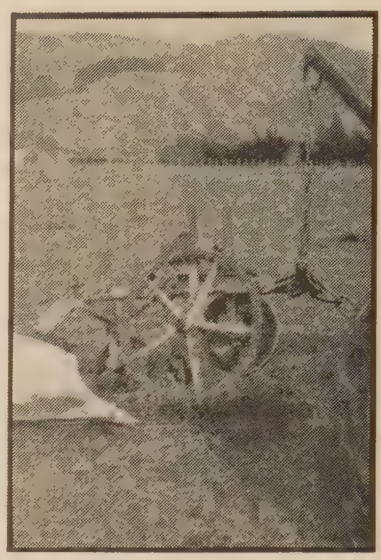
# CONVERSION OF HAND PLOUGH TO TRACTOR LIFT

By D. M. E. MERRY,
Instructor in Agriculture,
Department of Agriculture, Nelson.

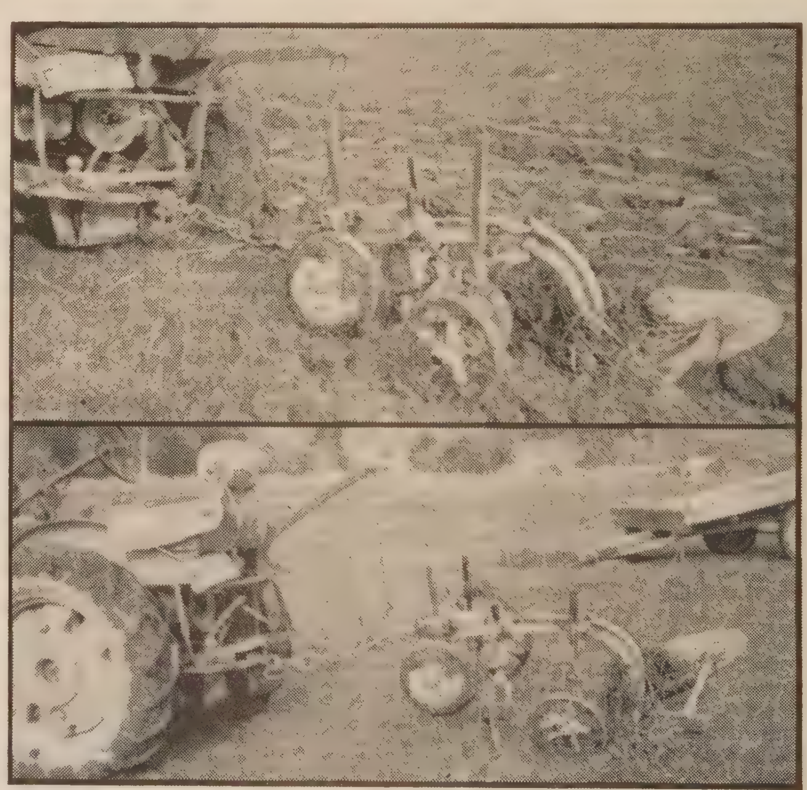
THE illustrations show a single-furrow digger hand plough coupled to the hydraulic lift of a tractor mower attachment and functioning as a hydraulic-lift plough. Alterations to the hand plough, apart from removal of the handles, consist of fitting a rear land wheel which for ploughing is adjusted to the same position as the front land wheel. The function of this extra wheel is merely to prevent the plough from overturning when lifted out and for towing free.

On the tractor a lift bar is coupled direct to the hydraulic piston and on the other end of the bar a chain from the towing bracket on the plough is attached by a U bolt. It is essential for the point of lift to be adjusted correctly on the towing bracket, as, if the line of draught is interfered with, the plough will not turn a full furrow when re-entered. On the plough shown the lift was taken about 9in. out from the beam.

The conversion outfit is the property of Mr. Y. O. Sutton of Richmond, Nelson.



This shows how the fitting of the extra land wheel prevents the plough from overturning when it is lifted out.



Upper—The working position of the plough with the tractor lift-bar attached to the hydraulic cylinder on the tractor and pivoted on the mower-bar attachment. The lift to the plough at the other end is taken through the U bolt and chain. Lower—The plough lifted from the furrow and trailing on the extra land wheel.

# Restoring Canterbury Soil Fertility Through Pastures

**WHAT can be achieved by good management methods to restore soils in which the fertility has been drained by heavy cropping is described in this paper by E. G. Smith, Fields Instructor, Department of Agriculture, Rangiora, which was read at the 1948 conference of the New Zealand Grassland Association. The paper describes how, in a comparatively-short period, the owner of a 500-acre property in North Canterbury succeeded in raising very substantially the productive capacity of the farm.**

THROUGHOUT Canterbury there is an abundance of farms which, as a result of a protracted programme of cropping without due attention to a suitable rotation, have gradually become depleted of much of their original soil fertility. Under a continued system of incorrect management this depletion has inevitably reached the stage at which further cropping has become uneconomic, owing to reduced yields. When this regrettable stage has been reached something has had to be done—some alteration in the management has had to be made in an endeavour to rebuild the fertility of the soil.

When this point has been reached different farmers have adopted different methods of attaining the desired end. In a minority of cases when sufficient capital has been available to permit the owner to neglect temporarily the maintenance of income, the restoration of the soil to good heart has been accelerated. In most instances, however, restoration has been very gradual, as the farmer has been forced to maintain a reasonable annual income and at the same time return a small instalment to the "bank of soil fertility." A few farmers, through exceptional methods, have reached the desired end fairly rapidly without the use of capital which has not been produced on the farm—so with the property of 513 acres owned by Mr. E. Rands, of Springbank, North Canterbury. This farm, which is located 8 miles west of Rangiora, on the Oxford Road, has behind it a history of heavy cropping which, though very profitable in the early stages, led gradually to the depletion of soil fertility with a corresponding fall in crop yields. The climax was reached when the average wheat yield fell to the uneconomic figure of 19 bushels per acre, whereas in good seasons some years before yields had averaged 35-40 bushels.

[Green and Hahn Ltd. photo.

A cocksfoot-subterranean clover paddock near the homestead.

## History of Property

The property, which was taken over as a mixed farm more than 29 years ago, was called upon to produce approximately 100 acres of wheat annually for 25 years. In one year 200 acres were sown to this crop. The severity of this cropping programme is appreciated when it is realised that the soils on the property are far from heavy, approximately 200 acres consisting of light, stony flats and 300 acres of fair to medium silt loam on shingle. But the farm may be taken as typical of a large area in the district, the unimproved value of the property being £8 per acre.

The 25 years of wheat growing constitute the soil-depletion period which was brought to a close by sadly-falling crop yields. The next period started 5 years ago, since when the farm has been in the process of changing over from a typical Canterbury light-land mixed farm to a property of high-producing pastures devoted chiefly to the production of wool and fat lambs. During the last 5 years no wheat has been produced, the only annual cash crops grown being barley, oats, peas, and lupins. Yet within this short term cash returns have almost doubled what they were at the end of the 25-year period and indications of returning fertility are to be seen everywhere.

In bringing about this state of affairs Mr. Rands has adopted very successful and interesting methods of management, and always they have been methods which have maintained a working income—methods, in fact, which could be used by the average farmer under similar soil and climatic conditions. It is with the period of fertility restoration which this paper will deal chiefly, but before doing so, it may be of interest to give a brief account of the history of the property as a background to the present management.

### Part of Big Station

Originally the property was part of "Springbank," a station of 23,000 acres. It was taken up in 1851 by Mr. W. Kaye and sold in 1853 to Mr. Robert Chapman. In 1882 Mr. Chapman divided the station among his sons, but it was not until 1912 that the present state of subdivision was brought into being. In 1919 the late Mr. Rands (Mr. E. Rands's father) purchased the property, which he farmed until his retirement, when his son took over the management. With the exception of two paddocks, one of which had been cropped and one sown down with danthonia, the farm at that time was covered with tussocks and matagouri. There were several extensive areas of manuka and blackberry. The 513 acres was divided into 7 paddocks with wire fences and manuka hurdles. There were several small clumps of trees. The buildings comprised a 4-roomed cottage and thatched stable on the eastern boundary. A water race followed a devious course through the property.

The late Mr. Rands soon had a man at work with a 6-horse team and a plough. Most of his own time during the early period of possession was devoted to the erection of his homestead, farm buildings, and yards and the planting of shelter belts. The farmyard and buildings were placed well behind the homestead and shut off from view with shrubs and hedges. The house was thus removed from the main line of traffic and its location and pleasing appearance are a tribute to the late Mr. Rands's foresight.

### Subdivision

The farm was then subdivided into 21 paddocks, which involved the erection of more than 10 miles of fencing and the provision of 60 14ft. gateways. When the water race had been straightened and a new one formed water flowed through every paddock on the farm.

During the period it was being worked as a mixed farm the property

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The photographs in this article were taken on Mr. Rands's property after a prolonged spell of hot, dry weather and unfortunately do not do justice to the condition of the farm.

[*Green and Hahn Ltd. photo.*

Lucerne looking well even after a prolonged spell of hot, dry weather.

carried 400 half-bred ewes. Southdown rams were used and all lambs that did not go away fat off their mothers were fattened on rape. Ewes were wintered on turnips and, owing perhaps to the fact that hay was not always available, the death-rate was fairly high. The flock was maintained by the purchase every year of 4-year-old ewes. The practice was to breed from these ewes for 2 years and then sell them as fats.

During the 20 years from 1919 until his retirement in 1939 the late Mr. Rands concentrated his efforts on the production of wheat, wool, and lambs. The average yield of wheat from an area of 100 acres or more each year was very good for the class of land and almost equalled the returns from wool and lambs. In addition to the wheat Mr. Rands grew about 30 acres of oats each year for chaff and about the same area of rape and turnips. The rotation invariably followed was from grass to rape or turnips, with two crops of wheat following. Half the wheat area was spring sown to pasture under the crop. The other half usually went into oats and was sown down after harvest.

Pastures were thus left down for 4 or 5 years. This method of pasture establishment occasionally gave good results; eventually, however, it was found to be too uncertain, and, while pastures were still sown down after oats were harvested, they were no longer spring sown under wheat. Though a good strain of perennial ryegrass was always sown, pastures reverted to sweet vernal and other low-producing species within 2 years. During the remaining 2 or 3 years they were left down, stocking was necessarily light and, consequently, fertility declined steadily.

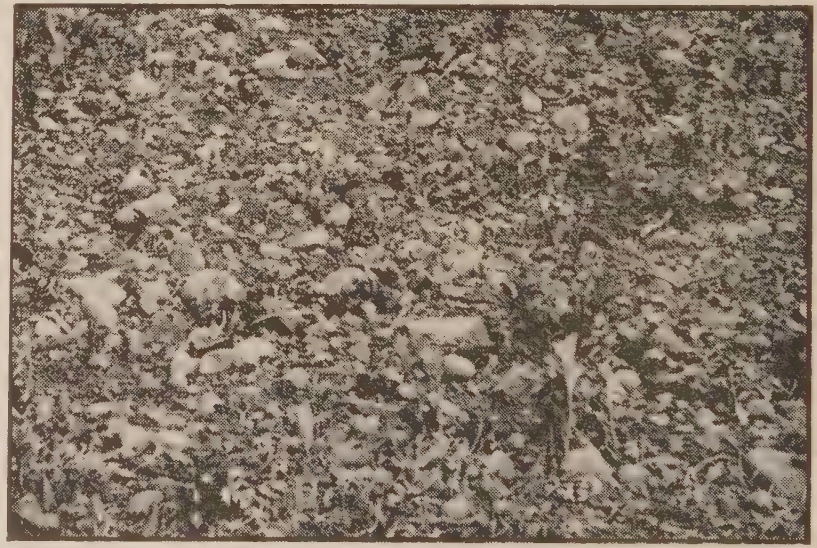
The years 1936 to 1940 were marked by a change-over to Certified seed of pedigree strains of perennial ryegrass and white clover and the adoption of a programme of experimental topdressing with lime and superphosphate. These two factors gave promising results—results which pointed the way to the future development.

### Lucerne Hay for Winter Feed

In 1940 Mr. Rands laid down an 18-acre stand of lucerne. He realised the importance of lucerne hay for winter feed and, subsequently, by feeding this hay, found that his ewes wintered better, there were fewer losses, and it was possible to reduce the area of chou moellier and turnips. After the stand had been down for 2 years extremely dry weather was experienced and it was found necessary to utilise the lucerne for grazing. Since then it has been fed off regularly, being fenced in breaks to prevent over-grazing, and, after several years of this type of treatment, the stand is still quite good.

Though Mr. Rands realised the detrimental effects of such cropping on the soil, he continued to grow wheat through the war until the average yield over 100 acres dropped to 19 bushels per acre. He then tried to maintain production by growing barley and peas for 2 years, but met with little success. Continuous cropping over a long period had drawn on fertility to such an extent that the growing of annual cash crops was no longer payable.

**This was the point at which it was decided to try to build up fertility by growing lupins and by establishing better pastures. In effect, Mr. Rands decided to change over from a mixed farm to a sheep-grazing property growing only occasional cash crops.**



[*Green and Hahn Ltd. photo.*

The light, stony ground on the lower area of Mr. Rands's farm.

It is necessary to give a short description of the farm in order that the outline of the management, given later, may be better understood: A terrace runs east and west along the full length of the property dividing it roughly into two fairly distinct soil types. The lower area, of approximately 200 acres lying between the terrace and the road, is light and very stony; the 300 acres above the terrace is fair to medium silt loam on shingle. The whole farm has a northerly aspect.

## Use of Lupins

The basis for the improvement of the farm has been the growing of lupins. These built up soil fertility and as a result newly-sown pastures had the vigour which ensured good establishment. Mr. Rands's practice is to sow 80lb. of lupins with a bushel of oats in the autumn, thus producing the greenfeed required during winter and spring. The paddock is then closed from stock until after harvest, and yields as high as 20 bushels of oats and 30 bushels of lupins per acre are obtained. Whatever method of harvesting lupins is adopted much seed is shed and, by lightly working the ground after harvest, a dense crop of self-sown lupins is available for winter feed. The lupin paddock is then ploughed in early spring, summer fallowed, and sown to pasture about the end of January.

[*Green and Hahn Ltd. photo.*

The cocksfoot-lucerne pasture provides good grazing during the dry summer period.

The fattening of lambs during the dry summer period always creates a serious problem on the light-land farm. Mr. Rands soon realised that to increase carrying capacity he must prolong the growing season by the judicious use of the various high-producing pasture species. It was therefore decided to establish special-purpose pastures, each fulfilling a definite role in the grazing programme. Some such pastures would take up the running in early December when those of the conventional perennial ryegrass-white clover or subterranean clover type fall in production. Others would then carry on for varying periods until the ryegrass-subterranean clover paddocks came into production again. The feed supply would thus be maintained at a fairly steady level during the greater part of the year.

With this plan in view, Mr. Rands decided to sow down the whole of the lower area in such permanent pasture as would be not only resistant to grass-grub but would serve the main object—that of producing good grazing during early spring and summer. His reason for choosing the lower area of the farm for sowing down in permanent pasture was to avoid the high cost of frequent cultivation of stony land. In a few years he had 3 well-established paddocks of cocksfoot, perennial ryegrass, and subterranean clover. Each one was sown after a summer fallow following rape or turnips. One ton of lime was applied before sowing and 1cwt. of superphosphate was drilled with the seed. These areas have given consistently good production. In the recent provincial pasture competition the oldest area was placed first in its class.

[*Green and Hahn Ltd. photo.*

A Montgomery red clover area.

The rate of seeding was cocksfoot 10lb., perennial ryegrass 16lb., and subterranean clover 3lb.

A cocksfoot-lucerne pasture was laid down 4 years ago with 6lb. of cocksfoot, 11lb. of lucerne, and 1lb. of white clover per acre. Subterranean clover was not included, as the pasture was spring sown. Drilled in on limed and fallowed land in October it established well and produced a good bulk of feed.

In the spring of 1946, 30cwt. of hay per acre was baled. Later 100lb. per acre of machine-dressed white clover seed was harvested. After harvest the pasture was attacked by both grass-grub and porina, but, though it presented a sorry appearance during the winter months and no white clover was left in the sward, both the lucerne and cocksfoot made a wonderful recovery and the pasture is now even better than it was before the attack. This gives Mr. Rands ample proof that this type of pasture is very suitable for light land.

An effort to establish a second cocksfoot-lucerne pasture was not successful. The area was summer fallowed and sown with cocksfoot (7lb.), lucerne (11lb.), subterranean clover

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Stock on Mr. Rands's farm are provided with good shelter and shade.

(2lb.), and white clover (1lb.). The cocksfoot and subterranean clover dominated the pasture, with the result that lucerne failed to establish. However, the pasture is still a very useful one.

One paddock is being fallowed preparatory to its being sown down to cocksfoot and lucerne pasture next autumn. The whole of this light, stony area will then be in cocksfoot in association with lucerne in some paddocks and subterranean clover in others. Growth in all these pastures is strong and vigorous, giving high production and maintaining growth in dry periods.

## Special-purpose Pastures

On the better land above the terrace some paddocks have been sown in short-rotation ryegrass and white clover, some in perennial ryegrass and white clover, and others in a mixture of perennial ryegrass-Montgomery red clover and white clover. Each of these pastures, together with those on the lower area, provides good grazing during various periods and all combine to maintain production at a high level throughout the greater part of the year.

Every care has been taken in the laying down of pastures. Thorough preparation of the seed-bed after a summer fallow, the sowing of Certified Pedigree seed, and subsequent controlled grazing have, in all cases, ensured good establishment.

The short-rotation ryegrass-white clover pastures sown at the end of January produce well from April to September. During October, November, and early December the perennial ryegrass-white clover pastures are at their best. The Montgomery red clover paddocks, together with the cocksfoot-lucerne pastures, carry the stock well through the critical period from mid-December to March. In addition to these pastures, which produce well in succession, the cocksfoot-subterranean clover areas, if nursed through the autumn, provide good out-of-season grazing during winter.

**The establishment of these special-purpose pastures has been the key to success. Carrying capacity has been more than doubled and everywhere there is evidence of increased fertility.**

All paddocks have produced well; an area of short-rotation ryegrass and white clover can be given as an instance. This area was sown after an 18-acre paddock of Montgomery red clover was ruined by porina. The rubbish was ploughed in and in February, 1946, the area was sown down with one bushel of short-rotation ryegrass and 3lb. of white clover. The pasture carried 600 ewes for 8 weeks during the following June and July. It was fed off in 3-acre breaks and recovered so quickly that it was fed off three times. After a short spell the paddock was again grazed before it was closed for a seed crop and produced 40 bushels of machine-dressed seed per acre.

The white clover has taken possession in the pasture, now in its third year, and the short-rotation ryegrass has almost disappeared.

It has been the practice to close an area of Montgomery red clover each year in October for use as required. If the weather has been dry, the area has been used to wean lambs on to; if ample other feed has been available for the lambs, it has been saved for seed. Montgomery red clover, which is preferred to broad red clover because it is more persistent under grazing, is sown with perennial ryegrass and white clover, and, being later in making growth, it takes up the running when the ryegrass and white clover have dried off.

## Loss of Crops

Though in the main all has gone well for Mr. Rands, he has had setbacks. He lost two good crops of peas—one with hail and one with drought. On another occasion the greater part of 33 acres of barley was blown away. Grass-grub and porina have periodically taken their toll of pastures after small-seed crops have been harvested; then again, crops of perennial ryegrass have been affected by blind seed disease.

The practice of topping pastures plays an important part in their management and control. Topping checks the tendency of the earlier strains to run to seed and thus encourages the production of palatable leafage. Even with controlled grazing the topping of pastures is often necessary to maintain them at their highest state of production.

Mr. Rands appreciates the value of small paddocks and has subdivided 9 of his larger ones. Heavy stocking for short periods is possible on these smaller areas. This facilitates effective control of pastures and enables surplus feed to be utilised to advantage. Whenever necessary, pastures are grazed in breaks.

The ever-present possibility of grass-grub or porina attack is a serious concern of farmers, especially of those on light land. As a result of the ravages of grass-grub or porina, the whole feed position can be changed and the whole economy of the farm upset.

[*Green and Hahn Ltd. photo.*

Lambs being fattened on rape.

With his cocksfoot and lucerne and cocksfoot and subterranean clover pastures well established, Mr. Rands feels that he is well insured against such periods of acute feed shortage.

Mr. Rands's success in establishing the various pastures has been largely due to:—

1. Growing lupins, usually two crops in succession, to build up fertility.
2. Summer fallow and careful preparation of the seed-bed.
3. Sowing of pedigree seed.
4. Controlled grazing, suited to the characteristics of the various species. (Topdressing then helps to maintain production.)

## Lime and Fertiliser

One ton of lime is applied before final cultivation; then 1 ton is applied every fourth year or, alternatively, ¼ ton yearly. When it is available 1cwt. of superphosphate is applied, usually in February or March.

A 7-ton roller has been used on all pastures to bury stones and consolidate the ground; its use has made topping and haymaking possible and topdressing easier.

Because of the attractive returns that have been received from growing small seeds in recent years, Mr. Rands has often been tempted to close some of his pastures for seed. He has spent a lot of money sowing down pastures and there was a time when he felt justified in gambling on small seeds when he had surplus feed rather than increasing stock numbers. He has occasionally harvested small seed crops, but he does not depend on them. His aim is to increase his flock, as he depends on heavy stocking to build up soil fertility. In 1946, however, as a result of exceptional growth, a total area of 110 acres of white clover, perennial ryegrass, short-rotation ryegrass, and Montgomery red clover was harvested.

## Stock

When Mr. Rands took over the farm in 1939 the carrying capacity was 400 half-bred ewes and dry sheep. By 1947 he had increased this to 1000 ewes, but, on account of ill health, considered it wise to reduce his flock to 800 Romney cross breeding ewes and 200 dry sheep. Judging from the present feed position, 1000 ewes would still cause no worry.

Mr. Rands changed over from half-breds to Romney cross ewes when better pastures had been established. He felt that with the Romney cross he would be better able to control his pastures, have a better lambing, and have lambs that would be more easily handled. Each year sufficient 2-tooth ewes are bought from hill country to replace the cast-for-age ewes, which are sold fat. Southdown rams are used.

Half the total crop of lambs usually goes away off the mothers by the end of January, averaging 33-35lb. Owing to the fact that nor'-westers can soon alter the whole feed position, lambs are usually sold when prime rather than held on with a view to increasing their weights. It is not the practice to buy in lambs, though 400 were purchased last year and fattened on surplus feed.

Realising that carrying capacity is governed by the amount of feed available during the summer period, Mr. Rands plans to have the minimum of stock on the farm at the driest time. To achieve this he arranges the lambing so that full advantage is taken of the high spring production to fatten lambs and cast-for-age ewes. This practice also enables him to get into good order the ewes he intends to put to the ram in early autumn. Approximately 200 of the older ewes lamb in June. Greenfeed (oats and lupins) is provided for these ewes in addition to the short-rotation ryegrass pasture, which is specially reserved, and a cocksfoot and subterranean clover paddock which has been nursed during the autumn for this purpose. Over a period of 4 years, including some bad winters, this practice has proved profitable.

The main flock starts to lamb late in July, so it is possible to have the bulk of the lambs off their mothers before production falls away with the dry weather. As mating at the end of February, which is early, does not allow time for flushing ewes bought in autumn, 200 ewe hoggets have latterly been added to the flock each year.

Though there have been periodical bouts of foot-rot, it has been found practicable by early treatment and isolation to keep infection to the minimum. No trouble is experienced with internal parasites, as the older sheep are disposed of every year and replaced by hill-country sheep, pastures are kept clean, and lambs are weaned on to fresh, clean paddocks. A hay crop is usually taken off the cocksfoot-lucerne paddock and the weaned lambs are put on the aftermath, which provides a clean pasture very well suited for the purpose. From the cocksfoot-lucerne paddock the lambs go on to rape. As they are in good condition by the time they go on to rape, a smaller area of the crop is required than would be the case where lambs lacked condition.

## Implements

The 20 h.p. tractor used on the farm which was bought in 1938 is still working efficiently. A lighter one has recently been purchased for use at rush periods, and in addition a power mower, tedder, and new 3-furrow plough have been added to the range of implements. Very often heading, topping, haymaking, or cultivation have to be done at the same time. The header is regarded as a very necessary part of the farm equipment.

The policy throughout has been to pay for all equipment and improvements out of revenue. Mr. Rands has erected 70 chains of fencing, planted and fenced 30 chains of shelter belts, built a hay shed, and improved his dip and yards.

Crutching, shearing, lime spreading, hay baling, and carting of hay to the shed are done by contract. During the war years a boy was employed. Help for seasonal work is secured as required.

Mr. Rands intends to lay down a stand of 30 acres of lucerne next autumn, which he hopes will provide sufficient hay for 1000 ewes. He also intends to sow down another cocksfoot-lucerne area in the autumn and is considering the establishment of an area of *Phalaris tuberosa* for winter greenfeed.

There is no doubt that this property is being well farmed. A few years ago soil fertility was depleted to such an extent that the growing of white crops was no longer payable and stock-carrying capacity was poor. To-day the fertility of the soil has been restored. If prices for wool and fat lambs drop, Mr. Rands can again turn to cropping and his crop yields will be quite satisfactory. With the knowledge he has acquired during the last few years, it is certain that by the adoption of a sound crop rotation Mr. Rands will have no difficulty in maintaining soil fertility.

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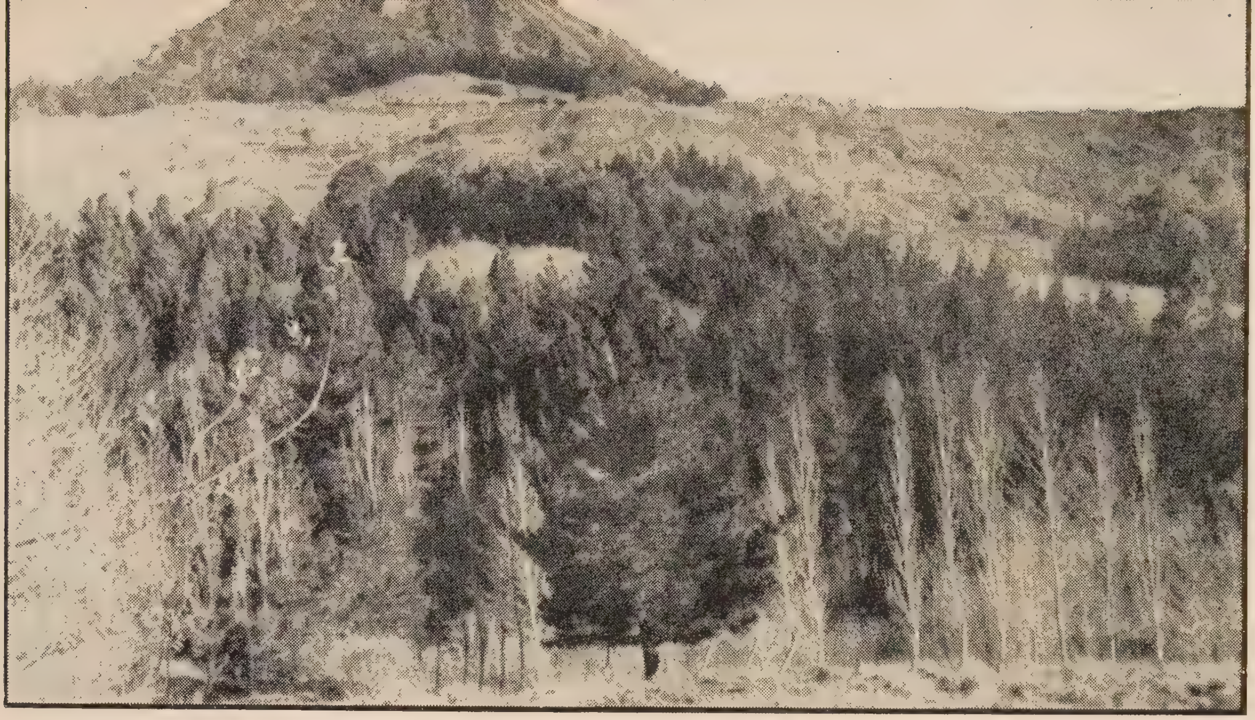


HEADING PHOTOGRAPH: Looking northward to Puketiti peak. *Pinus radiata* were planted to consolidate a moving slope, with a closely-planted poplar species trial in the centre. Lombardy poplars were contour planted to hold the slope.

# Survey of Tree Planting on an East Coast Hill-country Farm

As a result of past injudicious clearing and burning of bush on hill country, many New Zealand farmers are now threatened with the development on their holdings of considerable areas of unstable, moving land and heavily-flooding streams. This menace can be controlled in part by the planting of trees and the formation of plantations in strategic positions, and such woodlands can also produce much-needed farm timber and shelter while adding greatly to the amenities and value of the farmlands involved. In the "Journal" for April, 1946, an account was given by V. P. Boot of protective planting carried out on Puketiti Station, Mr. A. B. Williams's east coast hill farm. In the following article M. Sutherland, Farm Forestry Officer, Department of Agriculture, Wellington, surveys the behaviour of different tree species and discusses aspects of the formation and growth of the plantations in the light of silvicultural development during 40 years of tree growing on this station.

BOTH success and failure are demonstrated in these plantations, but they are of special value in showing how, by simple and persistent annual planting, there may be built up throughout the farm a system of double-purpose woodlots which should become of considerable utilitarian value to their owner.

## Aspect and Climate

This station lies on rolling and broken country in Waipu County, about 3 miles west of Te Puia Springs township. It now covers about 6500 acres of hill grazing under introduced grass, and of this area it is estimated that about 60 acres are still under native forest, chiefly in scattered patches and valleys throughout the holding.

The lowest part of the holding lies 1000ft. above sea level, with the peak of Puketiti (1733ft.) rising in the centre. The ground lies generally to the east and north, but plantations have been grown on all aspects and this factor appears to have little influence on tree growth in this region.

The most general winds are from south and west, but comparatively little indication of any harmful influence of strong wind is apparent in the tree growth of the area.

The temperature record nearest to this locality—at Gisborne—shows a mean monthly maximum of 66.6 degrees F. and an average minimum of 47.4 degrees. The maximum mean monthly temperature is 95.2 degrees and the extreme minimum 32.4.

The annual rainfall at Puketiti is high, averaging 82.93in., with a mean monthly figure of 6.91in. and a maximum monthly rainfall of 10.14in. The average rainfall for the dry month is 3.18in. in November.

Frost occurrence is negligible in its effect on tree growth and no damage to plantations has been recorded at Puketiti.

## Soil and Topography

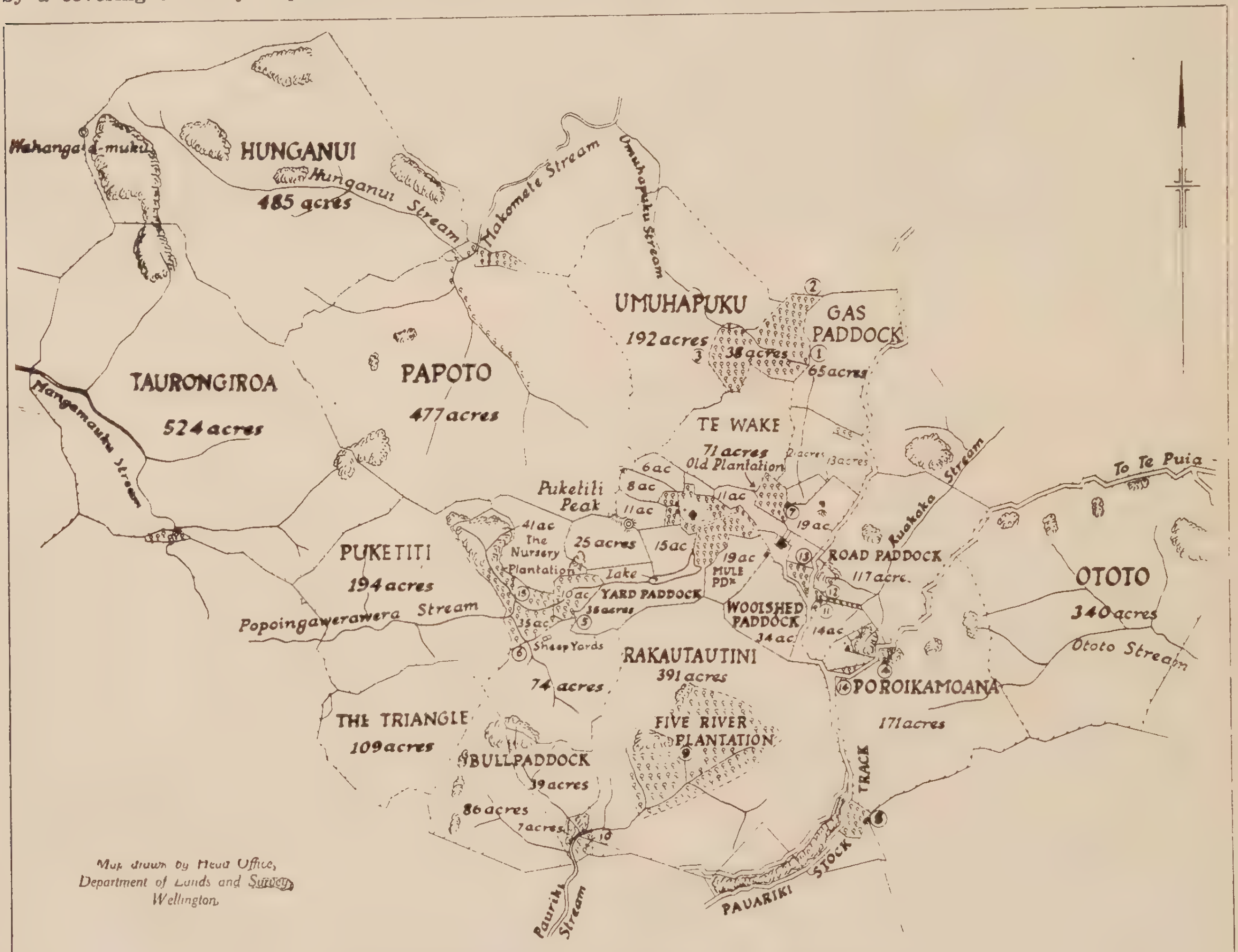
Two main soil types are found on the holding: Most of the higher knobs are of the Matakaoa sandy loam of the brown loam group, with 4 to 6in. of brown sandy loam on dark yellow sandy loam on rotted, compact, yellow loam; on the lower slopes occurs the Mangatu clay loam of secondary podzol series of soft blue mudstone with sandstone bands, or 4in. of dull brown, moderately-compact clay loam on sticky mudstone clay. From general observation plantations would be expected to grow more rapidly on the brown loam areas.

The hilly area is much broken by watered valleys or gullies, many of them worn to sub-gullies by temporary stream flow, the margins being covered by unstable mudstone formation prone to mass movement of the surface layer known as "slumping." This process of land movement on steeply-sloping ground may be described briefly as follows: The original forest growth regulated the absorption of moisture and the soil surface was held in an absorbent but not waterlogged condition, but after the clearing of native vegetation and the burning of the top mat of humus covering, and with the sowing of English grasses and introduction of stock, the land surface becomes unstable. During heavy rainfall, with the original ground cover gone and bare conditions brought about by constant grazing, the excess water, instead of being soaked up gradually by moss and humus, runs rapidly downhill in many runnels, which join together and cut into the soft soil. Entering the stream at many points, they greatly increase the volume of water carried by the streambed. The stream overflows and the excess water sinks into the adjoining banks, making the soil soft and heavy. The local formation is characterised by a covering of sticky clay soil imposed on the mudstone underlay with which it never incorporates, and the moisture, percolating from the surface, collects along the line of this stratum, causing a breakaway of the heavy wet soil. This slides downward of its own weight, piling up at the base of the slope to form a hummocky "toe" where the stream cuts round the foot of a hill.

In addition to the slumping movement of the land which is prevalent on this area, the excess water collected in streambeds during the frequent heavy rains causes a physical breaking down and washing away of the banks, so that the course of any stream is likely to become altered with a big rainstorm.

### History of Planting

A large proportion of the inland area of the station was originally in forest, with the seaward slopes in fern. Manuka was not common and, curiously, it is reputedly difficult to establish manuka as a planted crop on any of the Puketiti area. The bush on the holding was cleared and burnt and the ground grassed down about the beginning of the century, and the area was stocked first with Lincoln sheep and later with Romney sheep and a few cattle.


Wahanga-a-muku
HUNGANUI
485 acres
Hunganui Stream
Hakomale Stream
Umuhapuku Stream
UMUHAPUKU
192 acres
38 acres
GAS PADDOCK
65 acres
TAURONGIROA
524 acres
Hangamauhu Stream
PAPOTO
477 acres
TE WAKE
71 acres
Old Plantation
2 acres
13 acres
6 ac
8 ac
11 ac
11 ac
Puketiti Peak
41 ac
The Nursery Plantation
25 acres
15 ac
19 ac
19 ac
MULE PD.
Lake
10 ac
YARD PADDOCK
36 acres
35 ac
Sheep Yards
Kuakaka Stream
ROAD PADDOCK
117 acre.
WOOLSHED PADDOCK
34 ac
14 ac
To Te Puia
OTOTO
340 acres
Ototo Stream
PUKETITI
194 acres
Popoingawerawera Stream
RAKAUTAUTINI
391 acres
74 acres
POROIKAMOANA
171 acres
THE TRIANGLE
109 acres
BULLPADDOCK
39 acres
86 acres
7 acres
FIVE RIVER PLANTATION
TRACK
STOCK
PAVARIKI
Pauriki Stream
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15

Map drawn by Head Office, Department of Lands and Survey, Wellington.

TREE PLANTING TO CONTROL SOIL EROSION ON PUKETITI STATION

## KEY TO SPECIES IN PLANTATIONS

1 and 4—*Eucalyptus sieberiana.*

2—*Eucalyptus saligna.*

3 and 5—*Eucalyptus regnans.*

6—*Eucalyptus gigantea.*

7—*Robinia pseudacacia.*

8—Willow plantation (*Salix fragilis* and *S. viminalis*).

9—*Pinus radiata* and *Cupressus macrocarpa.*

10—*Cupressus macrocarpa.*

11 and 13—Oregon pine and redwood, mixed crop.

12—Poplar species trials.

14—*Eucalyptus obliqua* and Lombardy poplar.

15—*Cupressus macrocarpa* and *Pinus ponderosa.*

*Pinus radiata* planted on the margin of bush and to hold moving ground on the upper slopes of the watershed.

After the first few years of clearance, and especially after heavy rainfall in 1916-17, the effects of clearing the absorbent and anchoring tree layer began to be apparent in slips, soil slumping, stream agradation, and cutting of gullies and streambanks. General instability of the upper soil layers occurred in certain areas of slope. The owners then realised that some means must be found to counteract the effects of loss of forest cover and to hold up the movement of land in vulnerable areas.

In 1902 tree planting had been started in the vicinity of the homestead site and block plantations were established on the slopes of hills. Experience with these projects suggested that, with the erection of physical barriers and groynes, the planting of certain types of trees on unstable areas acted as a brake on the movement of the ground by anchoring the surface layers at various points.

**The usefulness of willow and poplar planting to arrest the movement of soil on unstable areas was noted and the practice was increased until gradually it became the basis on which all subsequent protective planting has been carried out.**

The first introduced trees were planted on the holding in 1902 in the home plantation, and plantation formation was carried out annually in the years following until the First World War, the greater part of the early planting being done in 1907.

Some block plantations were formed between 1916 and 1939 in which trials were made of new species—conifer, broad-leaved, and eucalyptus species—and also of silvicultural methods and combinations. The technique of tree planting to arrest erosion was continually developed and put into practice as necessity arose in the main watershed areas where movement threatened.

Residual bush covers about 60 acres, and about 180 acres have been planted in utility species of trees in plantation formation; this is about 3 per cent. of the total area of the holding. The area covered by widespread protective planting of broad-leaved trees is impossible to assess, as much of this planted ground is now back to grazing use. However, the majority of the wide valley bottoms now have a protective cover of wide-spaced willows and poplars.

## Objects and Methods of Planting

With the methods of bush clearing by burning in use when this land was taken up it was not possible to select areas of forest for preservation or to protect isolated areas, because clearing fires could not be controlled and frequently spread further than was intended. However, the owners of the station were governed by an inherent impulse to plant trees, and the replacement of native forest by plantations of exotic species was a routine part of early station management. Tree planting at that period was primarily as shelter for stock and to produce farm timber, but general beautification of the station was also a strong consideration. After the value of these plantings in restraining threatened soil movements was recognised other objects of tree planting became an adjunct to the control of erosion.

In parts of the area deep gulches have been formed by flooded stream wash and marginal slipping, and it is necessary to attempt the arrest or control of further destructive action by treatment in each individual case or

The house was on a site at the right of this illustration which was abandoned when the land began to slump down behind it. The fence was built to enclose the moving gully from stock and the area was then planted with spaced willows and poplars.

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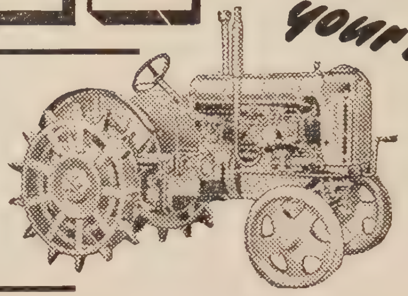

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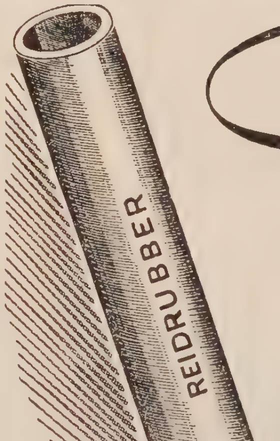

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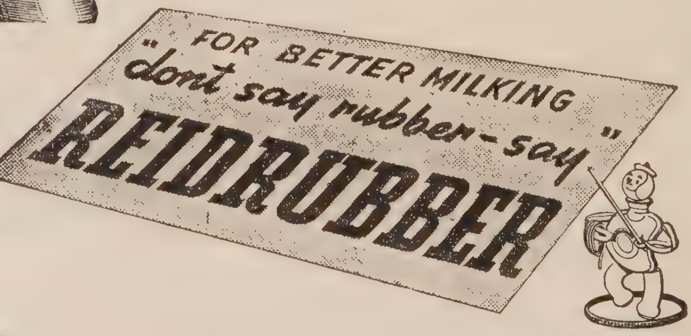

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Typical results on land which has slumped below a road. Widely-spaced crack willows were planted to prevent further movement, and the hummocks have grassed over.

by a general system of preventive management. In such work the main objectives are:

First, the immediate prevention of sudden increases in the volume of water fed to a streambed, and hence the stabilisation of the streambanks. This is attempted by regulating the rate of movement of water through the loose soil cover by the formation of a good, compact cover of grass, made possible by spelling from grazing, sowing, good pasture-sward management, and later by further subdivision and controlled grazing. In severe instances of stream agradation it may be necessary to give local protection to vulnerable streambanks and to control stream flow direction by the use of such physical means as groynes or tree planting in regions of the streambed; trees planted in the stream are also of some service to slow down the rate of flow within the banks.

Second, the local arrest of land movement—flowage and slumping—by the holding of slumping ground around the toes of slopes with widely-spaced trees, mainly willows or poplars.

Third, the ultimate consolidation of large areas above and around the fixed toes by the use of closely-spaced trees to form solid plantation blocks containing usually conifer or eucalyptus species.

**Tree planting at Puketiti is thus intimately bound up with the special conditions arising from the nature of the country, and as a result a routine procedure has been evolved resulting from the experience of years. Though on each area a different combination of conditions may exist and the exact procedure suitable for each must be considered, the same principles are observed in any piece of erosion planting.**

## Existing Plantations

The formation of plantations on a variety of sites and under varying conditions has resulted in a valuable series of tree crops demonstrating different species, ages, and silvicultural systems throughout the area. However, though in general species which prove suitable for growing on Puketiti land will probably produce as satisfactory growth on much of the coastal hill lands of Poverty Bay, there are dissimilar combinations of altitude, soil, and aspect which must be taken into account when estimating probable production from other new areas on this coast. All early planting entailed experimenting with species and, though definite indications of growth and suitability of several species can now be observed, a great deal remains to be learnt from this area about methods of establishment (such as spacing and mixtures of species) and the management of plantations of introduced species, both evergreen and deciduous.

For purposes of description the tree crops may be best classified as pure plantations of one species and plantations of silvicultural mixtures of species. The species which occur on the area in sufficient quantity for judgment are listed as follows:—

### Occurring as Pure Crops

**Conifers:** *Pinus radiata* (insignis pine or Monterey pine), *Pseudotsuga taxifolia* (Oregon pine), *Cupressus macrocarpa* (Monterey cypress or macrocarpa), *Sequoia sempervirens* (Californian redwood), and *Chamaecyparis lawsoniana* (Lawson's cypress or Port Orford cedar).

**Broad-leaved species:** Poplars (*Populus nigra* var. *fastigiata*, *P. alba*, and *P. serotina*), willows (*Salix vitellina*, *S. fragilis*, and *S. babylonica*), false or spiny acacia (*Robinia pseudacacia*), and puriri (*Vitex lucens*).

**Eucalypts:** *Eucalyptus regnans*, *E. obliqua*, *E. gigantea*, *E. sieberiana*, and *E. saligna*.

### Silvicultural Mixtures

Oregon pine with Californian redwood.

Oregon pine with eucalyptus species.

*Cupressus macrocarpa* with oak.

*Cupressus macrocarpa* with *Pinus ponderosa*.

Lawson's cypress with European larch.

Lawson's cypress with Oregon pine.

Lawson's cypress with *Pinus rigida*.

Lawson's cypress, Oregon pine, redwood, and native species (karaka, titoki, totara, kohekohe, olearia, and mahoe) with broad-leaved species of oak, some English beech, Australian blackwood (*Acacia melanoxylon*), silver birch, and a little elm.

## Pure Plantations

### *Pinus radiata*

This species was included in the earliest planting activities in the home plantation as odd trees or groups of trees among the general mixture of species employed. There are now some fine, massive trees of 40 to 50 years of age which are to be milled in the coming year. These old trees are growing chiefly on the upper slopes of ridges on the main brown sandy loam soil type, but growth apparently is equally good on the lower areas of grey-brown silt loam on clay loam.

In the younger plantations, formed on unstable mudstone slopes such as those in the Five River watershed area and Te Wake plantation, where the

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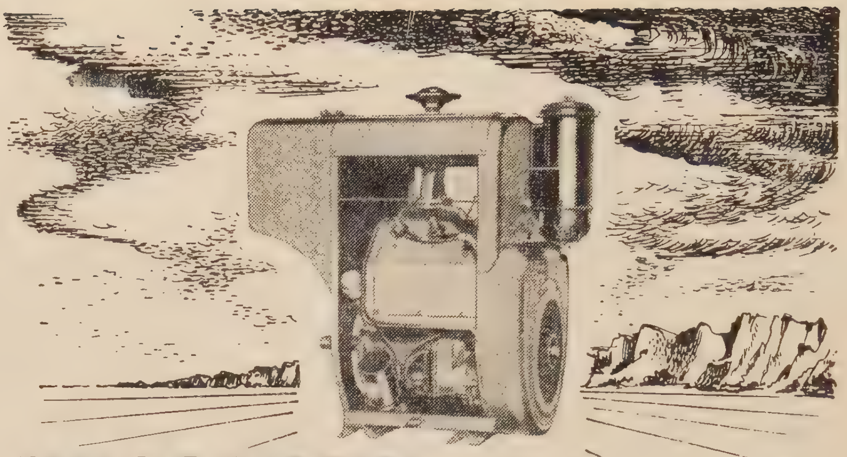

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Some of the original widely-spaced preventive planting of Lombardy poplar and *Eucalyptus obliqua*. The land was closed to stock temporarily and now provides good pasturage.

trees were spaced widely and in irregular formation, height growth is lower and rate of girth increase greater. To assess timber production on these soil types it would be necessary to make a complete statistical analysis of standing crops throughout all the plantations of this species.

*P. radiata* was not planted pure to any extent in the earlier operations, but was used as an edge strip on the exposed border of the old plantation planted in 1903.

Before 1912 a big area in Rakautautuni paddock, comprising the basin formed from the junction of five streams, began to give much trouble with flooding of the streams and "toe slumping" of the streambanks. After initial fixation with willows and poplars, the vulnerable areas were planted with *P. radiata* strips around blocks of *Cupressus macrocarpa*. This partly arrested the main ground movements, but after 10 to 15 years, when the *C. macrocarpa* had reached an average height of 35ft., most of them were carried away in a flood resulting from an exceptionally-heavy rainfall of 4 to 6in. in 10 days. The whole area was then replanted in *P. radiata* alone, and after about 20 years the area appears to be stabilised along 4 out of the 5 streams. The difficulty in the remaining streambed lies in the lower reaches, and it will require to be tackled by a combination of mechanical protection and special streambank planting.

The trees of *P. radiata* growing on Puketiti are of good timber-production type, with fairly-light side branches and regular boles. No excessively-large cones were observed, the average size being 4 to 5in., which is considered a good silvicultural type of cone. Unfortunately, no record exists of the origin of the seed from which the crops were produced, as most of the planting has been done throughout the years with bought-in commercial tree stocks.

On the whole, *P. radiata* in regular plantation has been planted too closely, the usual distance being about 6ft. x 6ft. in the early operations. This is shown in the belt planted along the northern border of a bush area in the nursery paddock where *P. radiata* at 6ft. spacing has made rapid growth and provided effective high shelter for the bush from the dry, cold winds, but has selected itself naturally with a wastage of killed-out stems amounting to about 40 per cent., and a consequent irregular crop. In 1928 *P. radiata* was planted from 8 to 10ft. apart as a northern border to the block of *Eucalyptus sieberiana*, and after 20 years these pines form an even stocking on the ground, though somewhat heavy branching would appear to indicate rather too wide spacing for best timber production.

*P. radiata* establishes readily from good 1-year seedlings, 12 to 15in. high, planted in autumn or late winter. This species is now regenerating freely both on grassed hills and within the older plantations of mixed evergreen and deciduous trees. This propensity to seed and regenerate is useful on ground where slips occur and provides a means of obtaining easy tree growth on unstable back areas of the station, but there is a possibility that in time this pine may become a "weed" species on these hills, especially as Mr. Williams has used it as protective belts around certain surviving bush areas and these belts may act as centres of seed dispersal.

**In the light of the satisfactory growth shown by certain other species planted at Puketiti and the silvicultural disadvantages of *P. radiata*, it would appear that this is not the best timber tree to use on this land where other species such as Oregon pine or Lawson's cypress of good quality can be grown. Confirmation of this view must await an area return in terms of timber utilisation and financial return, which will be obtained from the projected milling of the older timber crops to be carried out in the near future.**

### *Cupressus macrocarpa*

In the earliest plantings *Cupressus macrocarpa* was used either as marginal belts, only 2 or 3 trees wide, or in mixtures of species, and in general this has resulted in the formation of heavy-crowned, wide-branching trees. Even old trees which can be spared from the shelter belts are difficult to utilise, as they form the outer break, and when grown in mixtures where they have spread and suppressed the surrounding crop their removal would be difficult without damage to neighbouring good trees. These plantings demonstrate the mistake of planting *C. macrocarpa* in mixtures of trees which will not compete with it and thus produce a heavily-branched, unsuitable type of cypress tree. A certain number of posts can be procured from the branches, but usually there is a basal length of stem which requires too much labour to split and is often left as waste timber.

On Puketiti *C. macrocarpa* has been grown also in close plantation formation in 2 plantations, and growth can now be compared under different spacing conditions. A block in the lower section of the sheepyard plantation was planted in 1928 with pure *C. macrocarpa* spaced at 6 to 7ft., and this now shows a crop with good height growth, up to 50ft., but uneven and low diameter growth—probably the result of too close planting.

This may be compared with the growth on an adjacent block in which the cypress was planted in 1928 at an average spacing of 5 to 6ft. but in a mixture in which a proportion of trees (possibly 30 per cent.) were *Pinus ponderosa*. Growth of this species is slow and in the young state crown form is compact, so that the effect produced for the *C. macrocarpa* was one of wide spacing with excessive lateral branching partially controlled by the pine stems. The result was that the *C. macrocarpa* formed a crop of trees of more even growth than that in which close competition induced natural selection and uneven production. The *P. ponderosa* in this mixture may form a satisfactory permanent timber crop, on a rotation of possibly 50 to 60 years, while the cypress should furnish 2 classes of timber trees—smaller stems for fencing strainers and posts in the round or split, and mature sawn timber at 40 to 50 years of age for building construction.

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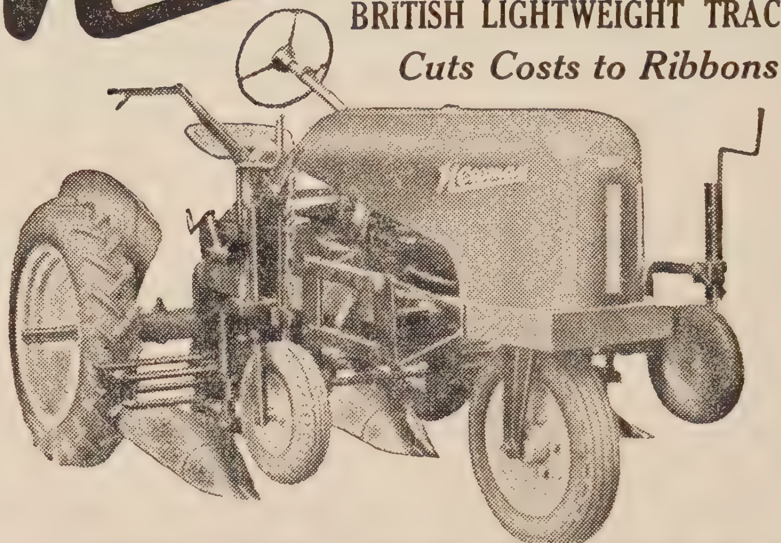

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### Oregon Pine

This species was planted in the early trials. In 1903 the old plantation was formed mainly of Oregon pine, with *P. radiata* planted along the margins except where a block of *Robinia pseudacacia* was established in 1907. In the decade following the planting the Oregon pine showed a high percentage of failures, but no apparent cause was recorded. (In the light of planting experience since that time it can be surmised that the failures were caused by a dry season following late planting.) Failures were blanked up with *Eucalyptus acervilla* on the theory that the eucalypts would catch up with the conifer growth, but though it has kept up in height growth the eucalypt crop has been crowded by the expansion of crown growth of the conifer crop, which probably was planted at a close spacing of 6 or 7ft. and has selected itself naturally.

That indicates the need for a wider spacing for Oregon pine on this land and provides an interesting comparison with the growth of another young block. This block was planted in pure Oregon pine at 9 to 10ft. spacing on an easterly slope of brown loam formation. It had no failures and is now 5 to 10 years old and showing good, even growth with an average total height of 14ft. and an average breast height diameter of 3 to 4in. The low average height would indicate that this spacing is too wide, but it is too early to base an opinion on this 1 plantation, especially in view of the similar growth form—low height and large diameter growth—shown by trees of this species elsewhere on the area.

Regeneration from seed cast by the older trees scattered through the mixed plantations around the house is good and would indicate the suitability of this species on the area. Provided the seed shows a sufficiently-high viability and germination percentage, these crops, grown at a fairly-high altitude, would be suitable as a source of Oregon pine seed.

Tall trees in the home plantation, planted between 1903 and 1910. The group of Lawson's cypress on the right is 38 years old. The lawn tree is a pin oak.

### Redwood

The oldest redwood trees were planted in groups in the home plantation in 1908, and though these trees now dominate the rest of the species the groups cannot correctly be termed pure blocks, as in early life they competed with the mixture of broad-leaved and conifer species planted among them. Measurements of the largest tree of these groups showed a diameter at breast height of 35in. and an estimated total height of 104ft. in 40 years. Two plantations which were planted as a mixture of redwood and Oregon pine have become almost pure crops of redwood, and details of these will be given under the heading of mixed crops, but no pure plantations of redwood have been formed on the holding.

### Lawson's Cypress

This species was planted in the same way as redwood as small groups in a mixture of conifers and broad-leaved trees, and a small area in the home plantation now demonstrates its possibilities if grown as a pure crop. This area was planted in 1913 as a mixture of *Pinus rigida* (pitch pine) and Lawson's cypress, but the pine died out when fairly young and was replaced, where an appreciable space was left, with Oregon pine. In places the Lawson's cypress have been left unblanked and now form a widely-spaced pure group of well-grown trees of estimated average height of 60ft. and 8 to 9in. diameter at breast height.

**These trees indicate that conditions of soil and climate on this area furnish suitable silvicultural conditions for the growth of this species. The quality of the timber produced now requires to be tested.**

* * *

The only broad-leaved tree crops planted in pure plantation on the area are of willow or poplar—both these being grown for land stabilisation rather than for the formation of woodland—and a very small number of acacias and *Robinia pseudacacia.*

### Willows

One of the earliest pure plantations was that formed about 1905 on the Puariki track, where at the head of the gully on shale-clay soil land was slipping badly just below the crest; this was fenced and 4 or 5 acres were planted fairly closely (12 to 15ft.) with willow (*Salix fragilis and S. vitellina*).

A mixed plantation of Oregon pine and Californian redwood 26 years old. The redwood dominates the crop in height with pines persisting on the margin.

An experimental block of poplar species, 9 years after being planted, with Oregon pine on the margin.

This area is now well fixed and carries a crop of trees providing an almost solid crown canopy—trees of great use in land control but of little utilisation value.

Widely-spaced willows have been planted on much of the area, using *S. vitellina* alone, a mixture of *S. vitellina* and *S. fragilis*, and to some extent *S. babylonica*.. The usual spacing is about 30ft. on land liable to movement.

An experiment was carried out on the Te Wake area using cuttings of the Chinese willow (*S. purpurea*), which was believed on the station to be distasteful to stock, though there is no evidence to prove this. These have formed a good covering of lower coppice growth (about 10ft.) and this species may be useful as a holding plant where a low height is preferred.

On this holding use is made of pollarded willow, in which the lower stem is branchless but a greater proportion of crown is formed. Whether this has any advantage in later growth is questionable, but if successfully planted these "pollards" with about 6 to 8ft. out of the ground form trees in a short time, able to produce anchoring roots. Stock cannot reach the top shoots of pollards.

**Poplars**

Poplars in mixture have been used extensively in widely-spaced protective planting, *Populus nigra, P. nigra* var. *fastigiata*, and *P. alba* being the species planted. The last-named suckers freely and in certain areas has now formed pure woodland.

Nine years ago it became desirable to plant over the head of a wide gully running north and south, with specially-good soil, to stabilise the ground, and opportunity was taken to make a trial of several species of imported poplars obtained from the State Forest Service nursery at Rotorua and which are being systematically tried out in various parts of New Zealand. The illustration on this page shows their general growth in 9 years compared with Oregon pine on the same site. *P. robusta* is one which is making good growth.

***Robinia pseudacacia***

A narrow strip of this species planted in 1907 at an elevation of about 1200ft. gives an indication of the possible growth at this high altitude. This crop now produces durable farm timber suitable for posts, but growth is slower at this elevation than that of a crop on similar soil at a lower altitude south of Te Puia.

The *Robinia* crop on Puketiti is of the commonly poor-stemmed type, with only short lengths of straight stem, but if this species were planted in suitable gully land and at regular spacing, a freer growth and therefore a better stem form might be obtained. Trials of the "shipmast" form are being made at Puketiti from root cuttings, which show rapid growth but are too young to provide any information.

**Puriri**

Two small groups of puriri planted as a pure crop indicate that sufficient growth can be made to provide post-size timber in about 30 years. Trees planted between 1915 and 1920 in a group near the house have now reached a total height of 30 to 40ft. with an average diameter of 14.7in. at 4ft. 3in. above ground level and utilisable timber up to at least 16ft. The trees in this group were widely spaced, and it is estimated that if they were grown at about 8ft. spacing, clean post timber could be obtained in lengths of 20ft. and more.

* * *

Useful samples of several *Eucalyptus* species, either in pure blocks or in mixtures of eucalypts, are growing on the Putiki area, and those showing most silvicultural promise are *E. regnans, E. obliqua, E. gigantea, E. sieberiana*, and *E. saligna*. Other species grown include *E. viminalis*, which has formed rather poor, badly-shaped, and branchy trees with brittle limbs; probably they originated from stock grown from seed collected from a poor-type and unsuitable Australian locality. *E. corynocalyx*, which is represented by a few trees scattered in mixed plantations, has formed trees usually of poor shape with boles inclined to lean from the perpendicular, but a few specimens of good, straight growth have been obtained and one is under trial as a telephone pole; short lengths have been used for posts, and the indications are that this species would be worth growing here for post timber. Plantations of eucalypt species were formed in some cases by direct seeding and in others by planting out from bush nurseries.

***Eucalyptus regnans***

A block of this species was formed in 1917 by cultivating narrow strips of ground 20ft. apart in which the seed was sown as in a nursery seed-bed. During the first year the seedlings were wrenched, and in 12 months they were thinned out by the removal of the superfluous plants and immediately transplanted into 2 lines between each strip, giving a spacing of about 6ft. This has produced a good, regular stand of clean, tall trees with stem diameters at breast height up to 13.3in. at 30 years of age.

The trees of this crop are noticeable in that they carry grey, fibrous bark up into the crown, while in typical *E. regnans* the upper bark peels off, leaving white, shining stems; this may indicate a special strain in the species or be caused by growth at an altitude higher than that in which this species usually flourishes in New Zealand. Mr. Williams is of opinion that this species is producing a useful class of saw timber, but technical tests are required to establish the value of growing this species on the east coast.

A pure block of *E. regnans* was planted in Te Wake plantation in 1924 and appears to be growing at a rate equal to that of the older crop in the sheepyard plantation. On the margin of this area *P. radiata*, which was planted to fix the unstable streambanks, has also been interplanted in the eucalypt block, and though the eucalypts still maintain height dominancy the pines are crowding them and must be felled within the next 5 years or so or they may compete with the eucalyptus crowns and reduce the general growth rate.

*Eucalyptus gigantea*

This eucalypt was planted in a pure stand in the sheepyard plantation in 1917 by the same strip method as used for *E. regnans.* It has made heavy timber growth with good height.

*Eucalyptus obliqua*

On an area where deciduous trees had been planted and failed *Eucalyptus obliqua* was sown in 1909. The seed was sown in strips and seedlings transplanted on the spot, and this plantation now carries a crop of trees with clean, straight stems, having made the highest volume increment of all eucalypt species on the area. The space between stems is now about 12ft., and with the spreading crown development of this species this crop requires a light selective thinning, which would leave a widely-spaced final crop to mature in possibly another 20 years.

The timber of *E. obliqua* is reputedly of good quality for large-dimension sawn boards or scantling, and a trial of this 40-year-grown timber should be made to establish its degree of maturity on this site. Tests for durability would furnish useful information, as trials in some parts of New Zealand indicate that mature timber of *E. obliqua* may furnish post timber durable up to 15 years.

On Puketiti this timber has been split fairly easily and is in use as rails and battens on station fences, but it has not been in use long enough to supply evidence of its durability.

A corner of Te Wake plantation planted with *Eucalyptus sieberiana* in 1924 at about 9ft. spacing.

The central area of Te Wake plantation, which was fixed by the planting of pollard willows *(Salix babylonica* and *S. fragilis)* and then Lombardy poplar.

*Eucalyptus saligna*

A crop planted 24 years ago on a southerly slope in the northern area of Te Wake plantation has made only fair growth. The height growth is low for this species at this age and the tree form is poor, stems being unduly branched and not of the clean, straight type characteristic of this species when growing under suitable conditions.

A few trees growing in mixture with broad-leaved trees in the home plantation on brown loam soil are of good height and form growth. In Te Wake plantation the poor growth is probably a result of too high an altitude, an exposed southerly aspect, and a shallow, clay-mudstone soil; this species prefers a deep silt or loam soil.

*Eucalyptus sieberiana*

**Apparently well suited to the conditions at Puketiti,** ***Eucalyptus sieberiana*** **is one of the most silviculturally - promising species which has been tried.**

In Te Wake plantation this species was planted 24 years ago on moving land of mudstone clay loam soil at about 9ft. spacing. It has now produced a tree crop of good height and uneven diameter growth up to about 18in.

An older block on the main roadway, planted 32 years ago, indicates the possible growth of this species. It was planted on a north-west slope on clay loam of the brown loam group at a spacing of 5 to 6ft. Growth has been excellent and, though the stocking is rather uneven, a full crop has been produced, now spaced at 10ft.,

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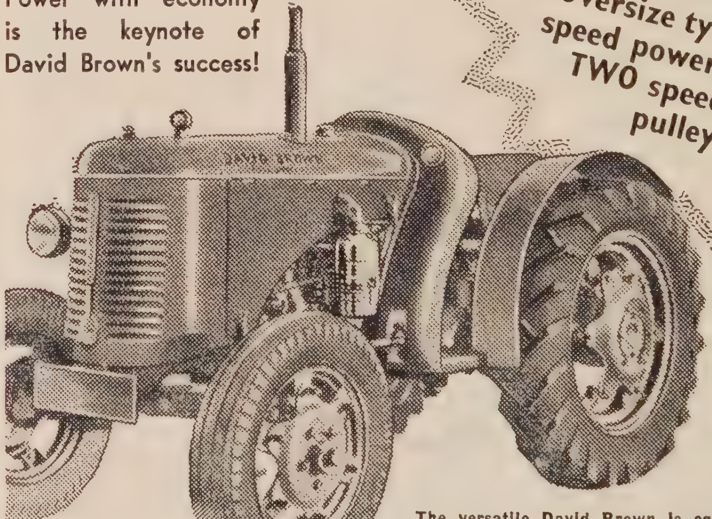

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Plantations of eucalypts on Te Wake plantation. The central portion is held by spaced planting of willow and poplar.

with an average total height of 137ft. and an average diameter of 18in. One big tree which was measured had a total height of 166ft. and a diameter of 24.3in.

No timber has been cut and tested at Puketiti, but it is possible that this species may be usable for poles if impregnated. Tests of its durability elsewhere have been made only recently and give no final results.

Prolific regeneration of this species, about 5 years old, has established itself on a thin soil cover on a rocky northerly face, which indicates a probable ease of establishment.

### Other Eucalypts

Other species of eucalyptus making satisfactory growth on this area are *E. botryoides, E. acervilla* (*ovata*), and *E. globulus*. A species deemed unsuccessful on this station is *E. hemiphloia*, which made only straggling growth and was cut out.

## Silvicultural Mixtures of Species

### Oregon Pine and Californian Redwood

In 1922 a block of land with a north-easterly aspect on a slope of 45 degrees was planted in Oregon pine and redwood spaced at 7 to 8ft. with trees of alternating species in each line. The surviving marginal trees are now chiefly Oregon pine, but throughout the plantation the greatest number of thriving trees are redwoods. The crop has not been thinned and has selected itself naturally in the ratios of 1 Oregon pine survived to 6 suppressed and 9 redwoods survived to 1 suppressed. In the total crop the average stocking of live trees is now 55 per cent. redwood and 45 per cent. Oregon pine, but most of the pines are suppressed and dying trees while the redwoods are growing vigorously, an average tree measured having a total height of 64ft. and diameter at breast height of 14.3in.

In general, these 2 species have the same requirements of soil, aspect, and climate, but early growth of Oregon pine is usually more rapid. In this case, evidently, optimum conditions have been provided for the redwood, which has overtaken the Oregon pine, which being more light demanding has gradually become suppressed as the height and lateral growth of redwood have overtopped its stems, shutting off light.

This block has also shown that this spacing of 7ft. by 7 or 8ft. between lines is too close for both species on this site. Spaced much more widely this mixture might be successful on this area, but the general conclusion is that both species should rather be grown in pure plantations.

### Oregon Pine with Eucalyptus Species

In the old plantation a block of Oregon pine was planted at 9ft. with the object of making this the permanent crop, but with the aim of obtaining early, clean timber fast-growing eucalypts were planted between the pines. It was planned to remove these after some years when they were no longer required to clean the conifers, but after about 30 years the eucalypts have made such heavy growth that it is now found impossible to remove the trees without risk of damage to the still-immature Oregon pines.

It is concluded from this trial that though the theory was correct it failed in practice in this mixture for several reasons. In this instance the exceptionally-suitable local conditions for the growth of eucalypt species produced unforeseen and excessive growth of the secondary crop and these eucalypts were left too long in the mixture. It would have been better to have sacrificed the trees by cutting them out when crowding first began, but removal became increasingly difficult, accentuated by the excessively-close original planting of the crop (4½ft.).

Such a mixture might be successful with much wider spacing—say, 12ft. between the Oregon pines with interspersed eucalypts—and if the eucalypt species used were one which had a slightly-slower height growth rate than that of the pines and were one which could be utilised and removed gradually in the first 20 years. However, with the rate of growth of Oregon pine shown on this holding it is thought that pure crops planted at suitable spacing would be preferable.

### *Cupressus macrocarpa* with Broad-leaved Species or Conifers

Groups of various mixed species with *Cupressus macrocarpa* are scattered through the older plantations. In most cases the mixture has been formed by the blanking up of failures rather than as planned crops.

The formed mixture in the sheep-yard plantation of *Cupressus macrocarpa* with *Pinus ponderosa* at 5 to 6ft. spacing is not satisfactory. It favours the growth of the cypress without cleaning it, while the pine tends to be overshadowed and retarded.

In another group the mixture was *Eucalyptus botryoides, Cupressus macrocarpa,* and *Pinus ponderosa*. The resulting crop after 20 years has become a struggle between the eucalyptus, which is now generally dominant, and the cypress, which has asserted itself in uneven groups.

A mixture of *Cupressus macrocarpa* with oak spaced irregularly but at an average distance of 8 to 10ft. appears to give promise as a satisfactory mixture on this area. The growth rate of oak is good where it is not exposed, and in this combination it may provide the necessary secondary cleaning crop to produce clean macrocarpa timber without being itself suppressed by the cypress, while the broad-leaved trees add appreciably to humus formation in the soil.

### Lawson's Cypress with Other Conifer Species

The oldest Lawson's cypress group has developed partially into a widely-spaced—now 20ft. or more—mixture of Lawson's cypress with European larch; this probably was the original mixture. Many larch have died out, but the remainder have made good growth and this now forms one of the most satisfactory mixtures on the holding. The cypress has made good height growth of about 60ft., with a good, straight bole, now partially cleaned up, and appears to be still adding to its diameter. One tree which had been down for about 4 years appeared to have perfectly-sound timber, and this will be sawn up for trial.

In 1913 Lawson's cypress was planted in mixture with *Pinus rigida*, but the pine failed to establish itself when the cypress crop was over 10 years old and it was interplanted with Oregon pine. This mixture so far has formed a good combination, and the Lawson's cypress has put on unusually-good height growth, but the 2 species are now competing for light and space and probably the mixture has been successful here only because the Lawson's cypress had 10 years' start and thus could hold its own in competition with the Oregon pine.

Natural regeneration of *Eucalyptus sieberiana* on a dry, rocky north-west face.

## Key to Management

Much of the planting at Puketiti which is now producing good specimens of various timber trees has been formed by the unsystematic establishment of a general mixture of species of broad-leaved trees, including native species, and conifers. These areas have received no thinning and show the results of competitive survival. In that respect they form a key to the most suitable trees for the locality, but the rate of growth of the best specimens cannot be taken as a criterion of their possible growth under plantation conditions.

On such areas the mixture of conifer and broad-leaved species has produced in its 40 years of growth a thickness of 2 to 3in. of true humus cover, which is now forming a forest soil in which regeneration of both introduced and native species is prolific.

**This holding thus demonstrates the possibility of re-establishing tree growth on vulnerable areas of this east coast country. It shows also the first steps necessary in employing tree planting as a routine item in station management for the immediate stabilisation and rehabilitation of slopes which are of more value under forest than when cleared for pasture and forming a potential focus for extensive erosion.**

## Timber Use

The tree crops now growing on Puketiti station collectively provide a valuable demonstration of the possibilities of growing many tree species, both exotic and native, under the conditions on that area. Plantations there show results from both good and bad silvicultural methods of growing trees, and samples are now available showing the growth of nearly 40 species of timber trees of ages between 20 and 40 years. However, little information is available about the quality of the timbers grown, and the owner has been more concerned with the possibilities and methods of growing the trees than with the utilisation of the timbers produced.

These plantations contain material which could furnish a vast amount of much-needed information about the growing and the utilisation value of many of the species now grown in New Zealand. Much information of this nature is available also from similar areas of trial plantings throughout the Dominion, and these at present form the important sources of knowledge on which to base any judgment of the behaviour of introduced species under New Zealand's varied climatic conditions, and especially of the potentialities of many eucalyptus timber species.

To be of most value all such information should be collected on an agreed systematic basis so that it can be analysed and correlated at a central clearing station, such as the State Forest Service experimental station. Such a Dominion survey, based on material now approaching maturity, would provide a knowledge of the quality and uses of available introduced timbers which is required urgently in this period of general timber shortage.

The rather random trials made to date at Puketiti give the following indications of timber use values:—

*Cupressus macrocarpa*: Strainers and posts cut from 40-year-old trees and air seasoned have given a life of 14 years and are still sound in the ground. Mr. Williams prefers to use timber from clean trees grown in close plantation rather than material split from rough, branchy, basal logs.

*Pinus radiata*, split for battens and preserved, has been used extensively on the station and shows an effective life of 14 years. Two types of preservation have been used—soaking the battens for a month in spent arsenical sheepdip, or immersing them in a mixture of equal parts of coal tar and used motor oil, boiling them for 1 to 2 hours, then draining them. The

A stockyard built with posts of home-grown *Robinia pseudacacia* and rails of *Eucalyptus obliqua*.

latter method has been used mainly for old and already air-seasoned battens, and the opinion is expressed that with the use of oil alone these hardened battens will not hold staples.

**Oregon pine:** Suppressed trees removed as thinnings and air seasoned are used for rails and are sound after 15 to 20 years. Small trees split into halves make excellent battens, apparently of exceptionally-long life.

*Robinia pseudacacia:* Timbers cut from trees 20 to 30 years old are used in the round as posts for fencing and in construction of stockyards. They show no deterioration in at least 10 years.

**Puriri** strainers cut from bush timber on the station and in use for 25 to 30 years show surface shrinkage but sound heart condition above and below ground. Indications are given that posts cut from trees grown for 20 to 25 years on the area probably will prove suitable for lasting use.

**Lawson's cypress:** 2in. x 1in. timber cut from probably the upper portion of a tree about 20 years old which fell in the plantation was used in a station gate after air seasoning for an unknown period, and it has remained sound for 9 years with 1 coat of paint.

**Willow,** split for battens, is soaked in spent dip and used extensively in farm fencing. No differentiation is made between the species of *Salix*.

*Eucalyptus acervilla* (*ovata*): Timber split from 20- to 30-year-old trees and air seasoned is used for gate posts. They give promise of being durable, but have not been tested for a definite period. Air seasoned, the timber is used for battens.

*Eucalyptus obliqua:* Battens and rails split from 40-year-old trees are being tested on fences. Rails in the round have been used in stockyard construction.

*Eucalyptus corynocalyx*: Scattered trees have been felled for trial. The timber is extremely hard and appears to be durable when used as posts without preservative treatment, and these trees are considered to give the best post timber of all the eucalyptus species grown so far. It may be a promising species for this purpose under Puketiti conditions if grown in close formation. The growth reached in about 30 years gives suitable dimensions for small pole timber, and a trial of this as a farm telephone pole has been put in hand.

## Planting Methods

Measures to combat land movement include 3 phases: First, fencing an area against stock and thus spelling it from grazing for several years while trees are established; that enables the land to become stable, and on a large holding the loss of use of the land is not as important as stabilisation. Second, the establishment of widely-spaced planting as a preventive measure, to fix and stop the land movement, or to hold the fixed area. Third, the formation of closely-planted areas to hold and stabilise the moving land; apparently this is of permanent effect when the correct species are used.

For widely-spaced planting poplars are preferable to willows, as they last longer and retain their regular shape, while the willows form heavy, branching tops, which die off much sooner and fall, leaving dead, troublesome snags on the land, which must be replanted. Probably more general use of osier willow (*Salix vitellina*) would produce a more uniform low cover, and when the area was opened to grazing its propensity to spread indiscriminately would be controlled by stock. The trial of *S. purpurea* (Chinese willow) is promising, and though stock do not appear to touch it it is apparently slow in spreading.

# TREE PLANTING ON HILL COUNTRY

A grove of puriri planted about 1915. Their average height is 30 to 40ft. and their average diameter 14½in.

In the formation of plantations the method used at Puketiti, where ground could be ploughed, of sowing tree seed in strip nurseries and using this area temporarily to produce tree stocks, part of which are left as the permanent crop, is suited to the type of planting which should be more widely practised on east coast high country. There planting operations must be undertaken as other station work allows, and with such a method the farmer does not depend on bought-in nursery stock with its delay in delivery and the danger of deterioration between the time the trees are taken from the nursery and the time when they are replanted.

**In the remoter areas some local system of co-operative raising of planting stock by farmer groups might be evolved. Acclimatised stock would then be available without excessive transport delays.**

## Mixed and Pure Crops

In the choice of the type of planting most suitable for the hill country these facts emerge:—

**Mixed crops,** if they include broad-leaved species, are of more value in forest soil formation and to provide conditions for natural regeneration of tree species. Mixtures of conifer crops have not proved satisfactory except in the case of Lawson's cypress and larch. The *Cupressus macrocarpa—Pinus ponderosa* combination indicates that a similar mixture at suitable spacing may produce a better macrocarpa crop.

**Pure crops** of 1 species with the rapid rates of growth produced under Puketiti conditions are more suitable for timber production. Mixtures formed by group planting have given good timber production, but are difficult to work in utilisation operations.

More information is required about the most suitable spacing in plantations for the main species. Wider spacing is indicated than has been general at Puketiti—probably 7 to 10ft., according to species.

## Successful Species

The following species are established as successful on this area: Oregon pine, redwood, *Cupressus macrocarpa*, *Pinus radiata*, Lawson's cypress, totara, puriri, *Robinia pseudacacia*, *Eucalyptus regnans*, *Eucalyptus obliqua*, *Eucalyptus gigantea*, *Eucalyptus corynocalyx*, *Eucalyptus sieberiana*, and *Acacia melanoxylon*.

Species of doubtful growth value are *Eucalyptus viminalis*, *Eucalyptus saligna*, and *Pinus ponderosa*.

Species unsuccessful are *Eucalyptus hemiphloia* and *Pinus rigida*.

**Local production of farm timber supplies will be necessary on the east coast and has been shown to be possible, but more knowledge is required of the utilisation value of species now being grown and further trials of other likely species are necessary. So far little guidance is available as to the best management of formed plantations for utilisation for farm purposes, and a survey and technical timber-use test would be of great value to farmers in the next decade. In this period also information may be available to enable an assessment of the financial returns of timber growing in combination with hill-country farming.**

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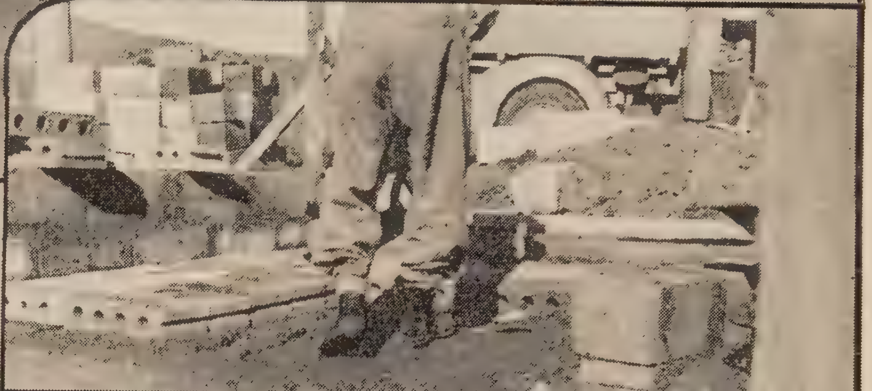


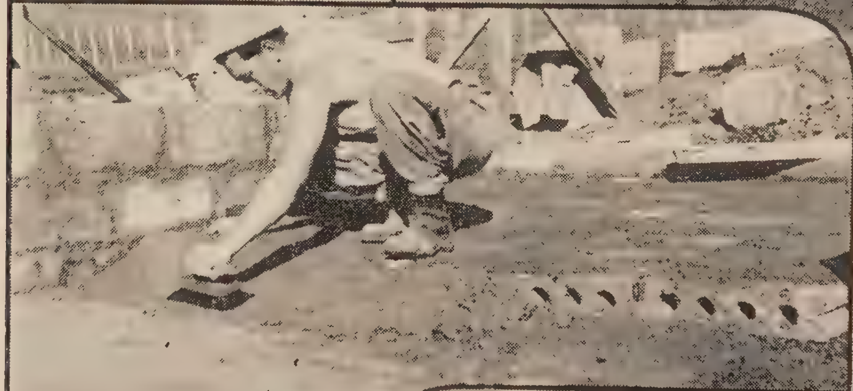


Fig. 3—The front is finished with a strip of solid concrete, sealing the air spaces. The strip is bevelled as shown.

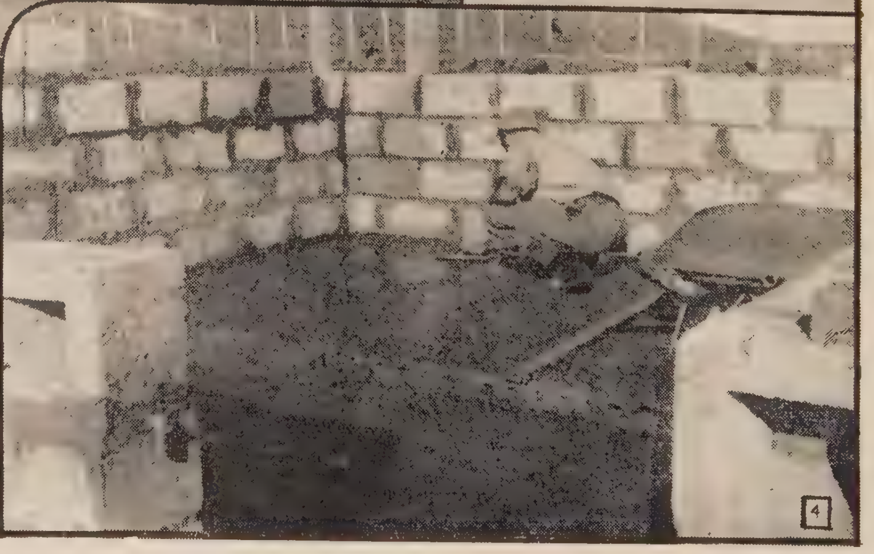


Fig. 4—The work is completed by plastering the whole surface with a 3 to 1 sand-cement plaster not more than ½in. thick. It is important that a very wet mix of plaster is used, as the blocks draw moisture out of the plaster, making it hard to work.

# Pig House Sleeping Floors of Pre-cast Blocks

**IN an article in the July issue of the "Journal" I. H. Owtram, Extension Officer in Pig Husbandry, Department of Agriculture, Wellington, described a simple method by which pig producers could build their own concrete pig houses with concrete or hollow-stone blocks. In this article he explains how sleeping floors for concrete pig houses can be made with special pre-cast floor blocks.**

THE use of special concrete-mixture sleeping floors in pig houses has become general of recent years, and their advantages over wooden floors are very great. An article on the laying of hollow coke-breeze concrete floors was published in the February, 1947, issue of the "Journal." Machine-made coke-concrete blocks for constructing this type of floor are now available, and their use simplifies the job considerably. Each block is 4in. thick, 18in. long, and 8in. wide, covering 1 sq. ft. of floor space. There are four circular holes 2in. in diameter running through the block from side to side, and there is a tongue at one end of the block and a groove at the other. These holes and tongues and grooves are shown in the accompanying illustrations.

## Laying the Foundation

The first step in laying these floor blocks is to put down a foundation of ordinary concrete. If this is laid on solid ground, it need not be more than 1in. thick, but if the ground beneath has been built up at all, or if there is any doubt as to its solidity, as, for instance, on sandy types of soil, the foundation should be at least 2in. thick. The necessary falls in the floor, generally ½in. in 1ft. from the back to the front of the floor, are put in when laying the concrete foundation for the floor. The fall in the sleeping floor must coincide with the fall in the whole floor area, and to achieve this the foundation for the sleeping floor blocks should be laid at the same time as the rest of the floor.

## Pegging Levels

The method of pegging levels to get the correct fall is not difficult, but it is most important that the falls should be correct.

Fig. 5 (below) shows the ground plan of a simple unit 8ft. wide and 16ft. long with a 3ft. race in front of it containing the main drain, the fall of which depends on the site and general layout. This fall should not be too steep, 1in. in 20ft. being ample.

After the walls of the units have been built the main drain is put in. The falls of all floors must connect with this drain, and unless the drain is put down first this cannot be done properly.

In the unit shown in Fig. 5 the trough is placed along the dividing wall between units, not along the front, and the doorway is in the opposite corner of the front; it is to this corner that a fall of ½in. in 1ft. is required over the whole floor area. As glazed-tile troughs are nearly always used nowadays, the space for the trough is left unconcreted and the troughs set in dead level after the floor has been put down. It is advisable not to excavate the floor area until the levels have been pegged; in building the walls a trench is dug for the foundations, and the earth in the floor area is not touched until the work on the levels is completed.

When the walls have been built up and the main drain finished a peg is placed at A in Fig. 5, the top of this peg being exactly level with the edge of the drain. A second peg (B) is driven in alongside A, its top being exactly 8in. higher than the top of peg A. Then with the aid of a straight-edge and a spirit level along the line between peg B and peg C (several temporary pegs will be necessary, as a straight-edge board of this length, over 16ft., is very hard to get) place a peg at C so that the top of it is exactly level with the top of peg B.

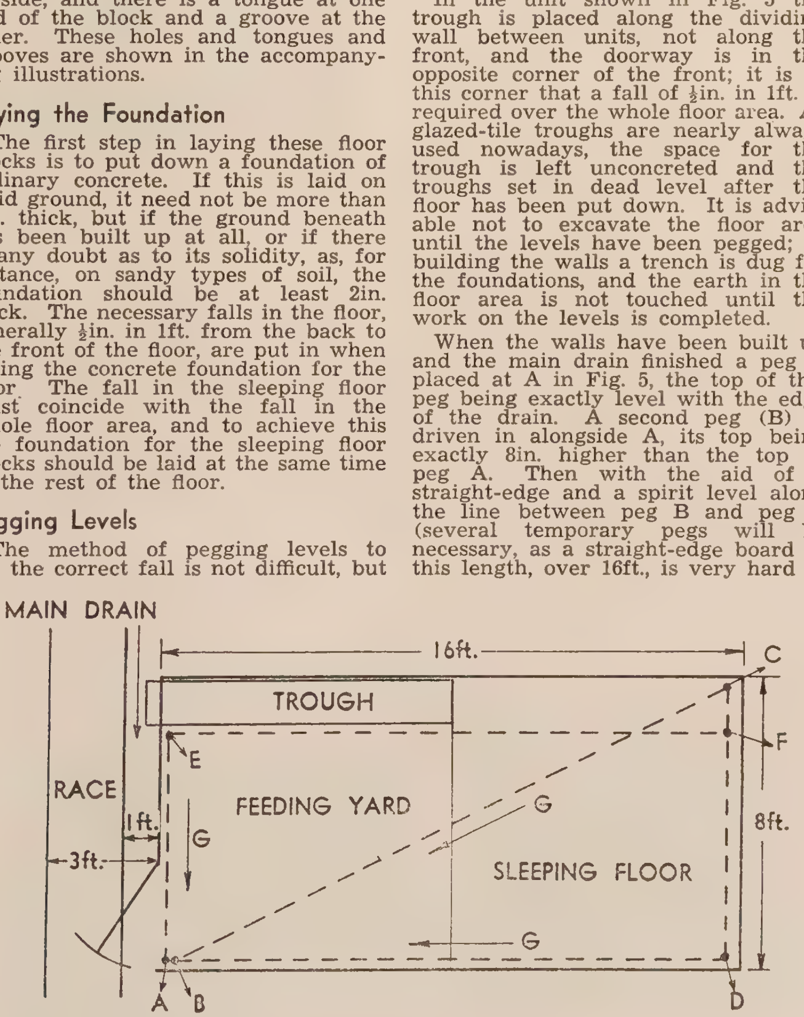


Fig. 5—Method of pegging the falls in a simple unit 8ft. x 16ft. A, B, C, D, E, and F—Pegs. G—Direction of fall ½in. in 1ft. to doorway at the front corner.

Again with the aid of the straight-edge and the spirit level place a peg at D, the top being exactly level with the top of peg C. While doing this a peg should be driven to the same level at F., a point 16in. from the side wall along which the trough is placed.

Peg B is driven down until its top is 3½in. above the top of peg A, and by the use of the straight-edge and spirit level peg E is placed with its top level with the top of B. This is to give a fall of ½in. in 1ft. from E to A. Peg B is then removed and five pegs, A, C, D, E, and F, are left and are so placed that if the surface of the floor is laid level to the top of these five pegs, a fall of ½in. in 1ft. is obtained over the whole floor area to the point A.

These are the master pegs. A certain number of intermediate pegs are necessary and these can be placed at the correct level by means of a string stretched tightly between the master pegs; the intermediate pegs are driven into the ground so that their tops are level with the string.

The floor area is excavated to the required depth, 2in. if the floor is to be 2in. thick, below the top of these pegs; screeds are placed in position and the floor laid. The reason for locating a peg at F is to have a straight line for levelling from E to F. The space for the glazed tile trough is left unconcreted until after the floors are finished, when the troughs are put into position.

## Placing of Blocks

When the concrete foundation has been laid and has been given time to set properly the placing of the blocks can be proceeded with. A rough surface must be left on the concrete foundation to provide a key for the mortar on which the blocks are laid. First, the blocks are placed so that their length is across the house and the holes in them coincide and run from the back of the sleeping floor to the front (see Figs. 1 and 2). A thin layer of cement mortar (3 parts of sand to 1 part of cement) is placed on the concrete foundation and the blocks placed on top of it.

The blocks are not placed directly against the walls of the house, but a space of about 2in. is left on both sides and at the back. This space is filled in with solid concrete when all the blocks are in position. It is not necessary to put any mortar between the blocks, as the tongue of one block is fitted into the groove of the next.

When all blocks are in position, and it takes about 50 of them for an 8ft. x 8ft. sleeping floor, the spaces at the back and sides are filled in and the front is finished with a strip of solid concrete which is bevelled as shown in Fig. 3. The reason for this is that if a sharp edge is left, both the edge of the concrete and, more important still, the pigs' feet will be damaged.

### Plastering the Surface

The final work is the plastering of the whole of the surface with a 3 to 1 sand-cement plaster not more than ½in. thick (see Fig. 4). A steel float is used and a very wet mix of plaster. This is necessary owing to the coke-concrete blocks drawing the moisture out of the plaster; unless this is mixed very wet, it becomes exceedingly hard to work.

In the completed floor the holes in the blocks form sealed air cavities running the whole width of the floor from back to front. This is the secret of the warmth of these floors. The air in the cavities becomes warm through the pigs lying on the floor and retains its temperature for some hours, even though the floor is unoccupied while the pigs are running out, so that there is always a warm floor for the pigs to lie on.

Concrete floors in piggeries should be kept as dry as possible and should be hosed down only when absolutely necessary or in very hot weather. Floors that are always wet are liable to be slippery and cause pigs' hoofs to soften and crack or wear rapidly, thus rendering them more liable to infection of the foot by organisms which are normally present in the piggery, but which do not cause damage unless they gain access through broken skin.

## New Meat Prices

THE opening schedule prices for lamb, mutton, and beef, announced by the Minister of Agriculture, Mr. Cullen, are as follows:—

**Lambs (Woolly)**

**Prime Down Cross and Prime Canterbury:** 20/36, 11½d.; 37/42, 11¼d.; 43/50, 10¾d.; 51/56, 10¼d.

**Prime crossbred:** 20/36, 11¼d.; 37/42, 11d.; 43/50, 10½d.; 51/56, 10d.

**Seconds:** 20/36, 10½d.; 37/42, 10½d.; 43/50, 9¾d.

**Wethers—North Island**

**Prime:** 48/U, 7½d.; 49/64, 7¼d.; 65/90 as 64, 7¼d. = 38s. 8d.

**Seconds:** 64/U, 6¾d.; 65/72 as 64, 6¾d. = 36s.

**Wethers—South Island**

**Prime:** 48/U, 7¼d.; 49/64, 7d.; 65/90 as 64, 7d. = 37s. 4d.

**Seconds:** 64/U, 6½d.; 65/72 as 64, 6½d = 34s. 8d.

**Ewes**

64/U, 5⅛d.; 65/90 as 64, 5⅛d. = 27s. 4d.

**Quarter Beef**

**Ox**—G.A.Q.: 720/U, 57s. per 100lb.; 0/720, 54s. F.A.Q.: All weights, 49s.

**Heifer**—G.A.Q.: 720/U, 56s. per 100lb.; 0/720, 53s. F.A.Q.: All weights, 48s.

**Cow**—G.A.Q.: All weights, 47s. 6d. per 100lb.

**Boner Beef**

Ox, bull, cow, heifer, 34s. per 100lb.

The Minister has also announced the new schedule prices for porkers and baconers, which are as follows:—

| | North Island | South Island |
|---|---|---|
| | d. | d. |
| Porkers .. .. | 10 | 10¼ |
| Baconers 121/175 .. | 10 | 10¼ |
| Baconers 176/185 .. | 9¼ | 9¼ |

## An Unusually-heavy Bullock

**AN outstandingly-heavy Aberdeen Angus bullock which achieved what is believed to be a record weight for the Manawatu was recently fattened by Mr. J. B. Mitchell, No. 1 Line, Kairanga. The liveweight at 9 years old was 2343lb. and the dressed weight 1779lb.**

ABOUT 5 years ago Mr. Mitchell bought a line of Aberdeen Angus stores and among them recognised a bullock which had great fattening possibilities. He kept it until it was 9 years old and had grown into the biggest bullock seen in the district for many years. It was a perfect picture of what a fat bullock should be, and showed the predominant Aberdeen Angus body type; there was a dash of Shorthorn in its blood, which, according to expert opinion, shows up in the hindquarters.

The liveweight was 103lb. more than a ton and the carcass dressed out at 1779lb. When the carcass was trimmed of excess kidney fat, etc., and dressed for export the frozen weights were: Hinds 427lb. and 426lb. and fores 409lb. and 398lb., a total of 1660lb. export cut.

*[Elmar Studios photo.*

The bullock on the hooks. Mr. Mitchell is on the left.

### Perfectly Proportioned

The size of the carcass is difficult to gauge from the accompanying photograph, as the beast was perfectly proportioned. A normal dressed side of beef hung alongside Mr. Mitchell's heavy bullock would show that the latter was twice the usual size. Though some very heavy bullocks have been killed in the past, it is not possible to ascertain what are record weights because full information is not available. Some records of the breed, age, liveweight, and dressed weight may have been kept by owners of animals, and these would assist in determining the record weights of different breeds.

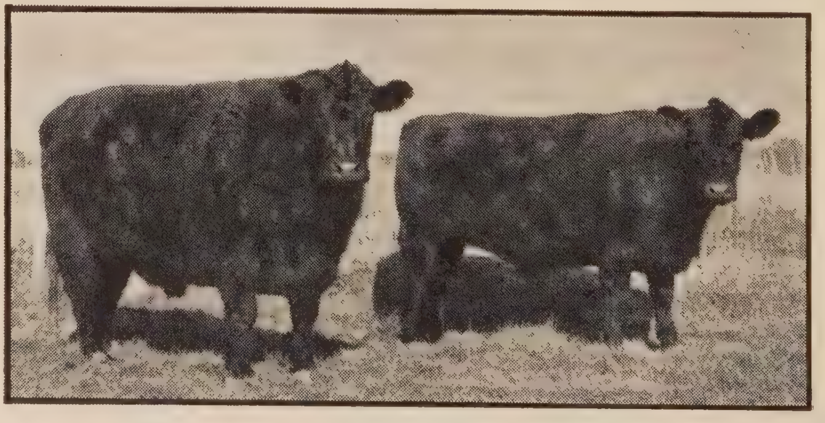
As far as is known at present the heaviest weights raised in the Aberdeen Angus, Shorthorn, and Friesian breeds in New Zealand are as follows:—

**Aberdeen Angus:** 9-year-old owned by Mr. J. B. Mitchell; killed at Longburn in 1949; liveweight 2343lb., dressed weight 1779lb.

**Shorthorn:** 6-year-old owned by Mr. A. T. Smith; killed at Kaiti in 1942; liveweight 2492lb., dressed weight 1724lb.

**Friesian:** Owned by Mr. A. Keith; killed at the Christchurch abattoir in 1926; dressed weight 2394½lb. This animal was the heaviest bullock of any breed known to be killed in New Zealand.

—*W. D. ROSS, Veterinarian,*
*Department of Agriculture,*
*Palmerston North.*



*["N.Z. Farmer" photo.*

Mr. Mitchell's bullock compared with a normal beast.

# Diseases of Bees in New Zealand

BEE diseases may be divided into two groups—those which affect bees in the larval or pupal stage, called brood diseases, and those affecting adult bees. Brood diseases include American foul-brood (the most serious of bee diseases in New Zealand) and sac brood, and diseases of adult bees include *Nosema apis, Malpighamoeba mellifica prell,* and Isle of Wight or acarine disease. They are the subject of this article by T. Palmer-Jones, Research Officer, Department of Agriculture Animal Research Station, Wallaceville.

The vegetative stage of *Bacillus larvae*, 1000 times natural size.

AMERICAN FOUL-BROOD is a brood disease caused by a bacterium, *Bacillus larvae*, which attacks both worker and drone brood, usually in the pre-pupal stage. Thanks to the system of registration and inspection of hives in New Zealand, foul-brood is under control, but it is still the most serious of bee diseases. Only rarely is a laboratory test necessary—if brood has become dried up and the characteristic physical appearance, ropiness, and odour are not evident. Normally Apiary Instructors and experienced beekeepers can recognise the disease.

When conditions become unsuitable for bacterial growth, such as after the death and complete breakdown of the larva on which the bacterium feeds, it changes from the vegetative or growing stage to the spore or dormant stage. These spores are resistant to changes in temperature and humidity and do not require food; they remain alive until they encounter a fresh host and so infect a new hive.

When diseased brood reaches the stage of drying in which it becomes scale-like the spores are present in enormous numbers. The highly-resistant spores are the cause of the difficulty always experienced in attempting to eradicate American foul-brood by methods other than gassing the bees with a cyanide compound and burning them and the infected equipment. However, boiling for 30 minutes can be depended on to destroy the virulence of spores of *B. larvae* under any ordinary conditions.

The disease is spread by robbing, transferring equipment, and exposure of honey containing spores.

### Control Methods

**Resistant stocks:** Bees less than normally liable to infection with American foul-brood have been bred with success in the United States of America. However, the resistance of these colonies is not a true resistance, but depends on the greater speed and efficiency of these bees in removing diseased and dead larvae, so preventing *Bacillus larvae* from obtaining a hold on the colony.

**Sulphathiazole** has been found to help bees to combat the growing stage of *B. larvae*, but it has no effect on the spores. Hence, if a hive is treated, all the stored honey which may contain spores must be removed before the medicated syrup is fed or reinfection may occur. A treated hive must be watched carefully, as the disease may recur. In New Zealand, which has a low incidence of infection, burning is safer and treatment with sulphathiazole is not encouraged. In some States of the U.S.A. infection is very widespread and burning of diseased hives would cause serious economic loss. The main points against the use of sulphathiazole may be summarised as follows:—

In some cases queen bees have been adversely affected by the drug.

There is some risk that the drug may reach extracted honey. Though it would be unlikely to be present in amounts sufficient to make the honey unsuitable for human consumption, such honey could hardly be sold as a pure natural food.

Amateur beekeepers are likely to experiment with the drug carelessly, so spreading foul-brood to the detriment of commercial apiarists.

A strain of *B. larvae* resistant to sulphathiazole may appear.

In the U.S.A. some apiarists are now forced to feed all their hives with the drug to keep down the disease, the spores of which have become distributed throughout their apiaries.

**The British authorities have officially banned the use of sulphathiazole because of the risks involved. There appears no doubt that, if it were used in New Zealand in its present stage of development, the sulphathiazole treatment would lead to a spread of American foul-brood which would be disastrous for the beekeeping industry.**

### Diagnosis

The method used for the diagnosis of *B. larvae* at the Animal Research Station, Wallaceville, is briefly as follows:—

A water mount of suspected material is examined for spores. This is only a confirmatory test, as other types of spore may resemble *B. larvae*.

The suspected material is boiled for 1½ minutes in water, so killing less heat-resistant bacteria.

The boiled material is used to inoculate special media. *B. larvae* will not grow on the ordinary laboratory media.

If growth occurs, the organism is stained and examined for the typical gram positive rods of *B. larvae*.

As a check the organism obtained is used to inoculate ordinary media. If the organism is *B. larvae*, it will not grow.

*B. larvae* has the power of reducing nitrates to nitrites, and this test is applied for additional confirmation.

## Sac Brood

A disease caused by a virus, sac brood affects only brood, causing it to die and assume a sac-like appearance.

An outbreak in Canterbury was investigated by the author in 1941. Though it caused much loss of hive strength in some apiaries, the outbreak was not a serious threat. Occasionally infected hives are reported in various parts of New Zealand, but the disease is now uncommon. No method of treatment is known.

Diagnosis depends on the sac-like appearance and absence of bacteria in the diseased brood.

## *Nosema apis*

A severe outbreak of *Nosema apis*, a disease of adult bees, was experienced in New Zealand in 1946-47, cases occurring throughout both islands.

*Nosema apis* is a parasitic, spore-forming member of the protozoa—microscopic, single-celled animals. The spores are more or less oval, about 2/10,000in. long and half as wide. Bacteria are roughly 1/25,000in. in diameter.

### Life Cycle

When *Nosema* spores reach the stomach of a bee they shed their

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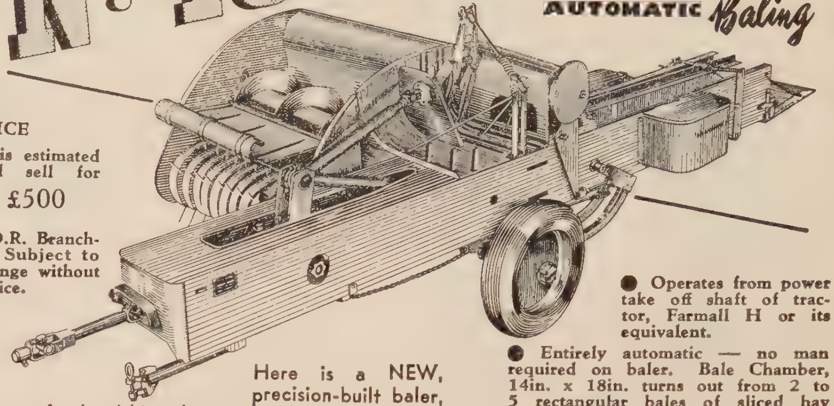

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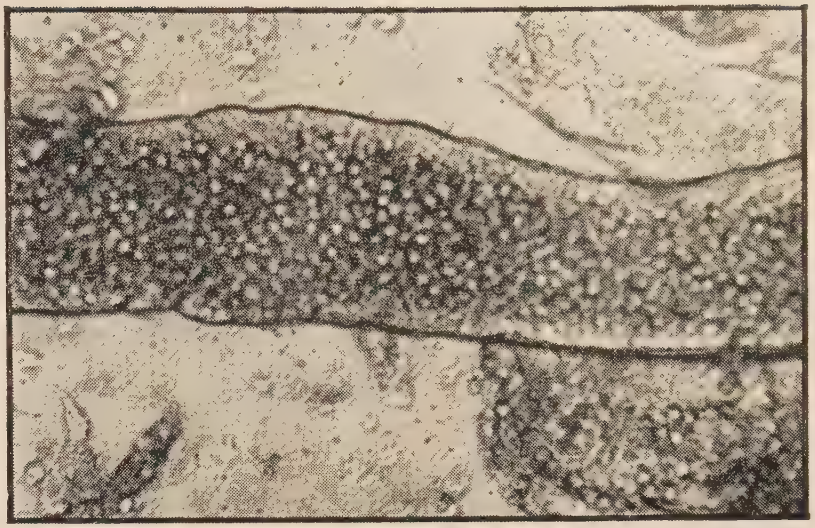
coats and liberate the parasites, which enter the cells lining the stomach. There they grow and multiply rapidly, and finally produce numerous spores, which pass through the bee and can infect a fresh host. These spores are thus the means *Nosema* has of perpetuating itself, as otherwise when the bee died *Nosema* would die also.

Field bees become weakened by the enormous number of parisites in their stomachs and are unable to return to the hives when out foraging. In badly-diseased hives all the adult bees may show some degree of infection. Queens are attacked, but brood is immune. The disease reaches its height in spring, though it may persist throughout the year.



The encysted stage of *Malpighamoeba mellifica prell* in the malpighian tubule, 430 times natural size.

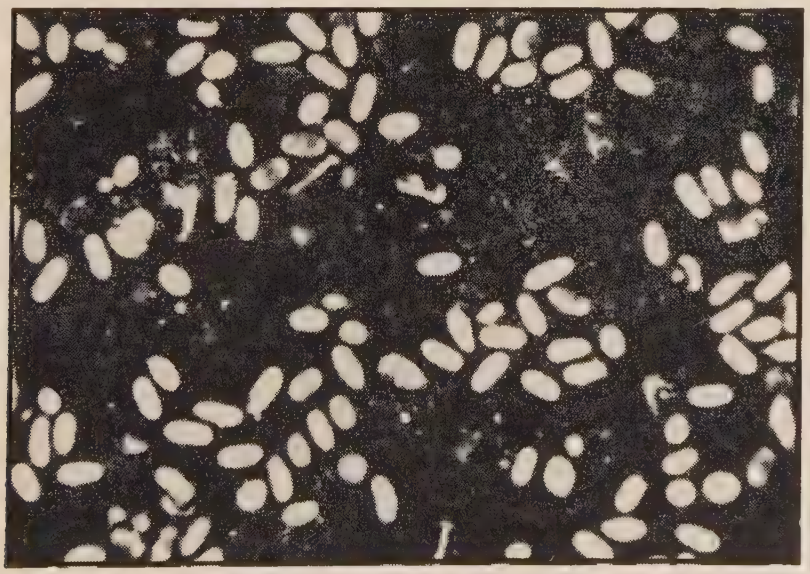
### Symptoms

A loss in hive strength without apparent cause is usually the first sign of infection, other symptoms often being difficult to detect. In very bad cases the bees may be seen crawling from the hives, being unable to fly, and there may be dysentery. Microscopic examination is necessary for diagnosis of the disease. Bees, preferably living, should be sent to Wallaceville for diagnosis after consultation with the local Apiary Instructor.

### Economic Importance

*Nosema* has been reported in Australia, Brazil, Canada, England, Germany, Switzerland, and the U.S.A. It would be suprising if it were not present in New Zealand, as it was reported in Australia in 1910. It was probably introduced to New Zealand in the early days of beekeeping, as it must be one of the commonest and most widely-distributed of bee diseases.

*Nosema* is a far less serious disease than American foul-brood. Strong colonies with a mild infection soon throw it off and recover, as was the case at Wallaceville. A weak colony with a heavy infection may die out, and occasionally a group of hives, perhaps with lowered resistance, becomes a total loss, but usually the economic loss to the industry is small. If the queen becomes infected with *Nosema*, the hive will decline rapidly and the bees may attempt supersedure. From past accounts of spring dwindling or reduction of hive strength in New Zealand there is little doubt that *Nosema* has been present for many years.



*Nosema apis* spores, 600 times natural size.

### Control Methods

Isolation of infected colonies is not recommended. In the case of such a widespread outbreak as that which occurred in New Zealand in 1946-47 isolation and disinfection of individual hives would be impracticable. Where dysentery occurs, hive mats should be burnt to prevent risk of their transfer to uninfected hives. Badly-infected hives should not be moved to clean apiaries. Contamination of drinking water and robbing of diseased hives probably cause the disease to spread.

Requeening a hive in which the queen is infected or combining it with the queen and bees of a nucleus hive is a step which is often successful. Treatment with drugs has not been found of use so far. One of the difficulties in assessing the value of drugs is that many hives recover naturally from *Nosema*, so control hives—that is hives not fed the drug—must be used. Treated hives and the untreated controls should all have the same degree of infection if the drug is to be tested accurately. The danger of any drug used reaching extracted honey which may be sold to the public and its possible adverse effect on the bees are important factors in such trials.

In the U.S.A. gentian violet, emetine HC1, chinoformin, tryparsamide, chlorosan, and sulphathiazole have been tested. None appeared to be effective.

In Russia b. naphthol, xerophorm, picric acid, urotropin, phenol, collargol, salol, and gramicidin were tried. None was satisfactory.

Dr. Butler, at Rothamsted, England, is trying the effect of stovarsol, propamidine, and tryparsamide. Trials have not been completed.

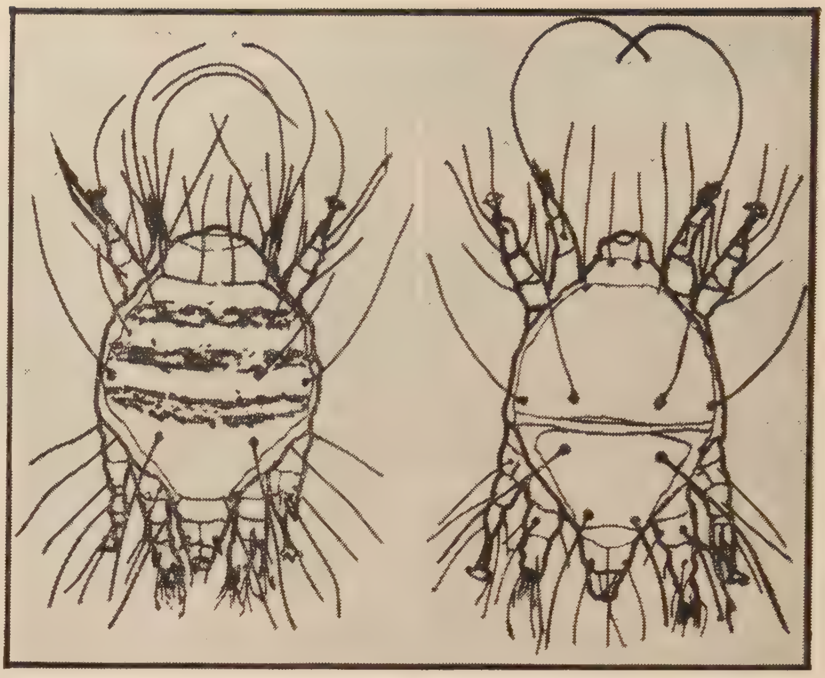
D. S. Robinson, Apiary Instructor, Department of Agriculture, Hastings, and the author have been carrying out trials of drugs against *Nosema* for several seasons. Drugs selected are known to be useful against organisms resembling *Nosema*. They are fed to hives in gradually-increasing doses, mixed in sugar syrup, so that tolerance of bees for them is first established. Finally, a group of hives is fed the drugs and samples from these and a control group are examined at intervals in the laboratory so that the course of the disease can be followed. Drugs already tested, with the weights fed in a single dose to a colony given in parentheses, are atebrin (3 grammes), sulphapyridine (5 grammes), phenamidine (4 grammes), stilbamidine (.75 gramme), and pentamidine (.25 gramme). None of these drugs has shown any promise, but the work will continue.

### *Malpighamoeba mellifica prell*

A disease affecting adult bees, *Malpighamoeba mellifica prell* is often associated with *Nosema*, but so far only one infected hive has been found in New Zealand (in August, 1948), though hundreds of bees have been examined for it. It is caused by a microscopic amoeba which destroys the cells in the malpighian tubules. It does not usually cause severe losses of bees and is regarded as of minor importance.

### Poisoning of Bees

Though poisoning is not a disease, it is mentioned because it can cause heavy mortality among bees. Usually it is caused by arsenic contained in lead arsenate used as a fruit tree spray. A serious blow to the industry, involving the loss of hundreds of hives, recently resulted in the Hawkes Bay area through the careless use of this spray. Apart from loss of field bees, pollen may be contaminated and may poison the brood.



Male (left) and female *Acarapis woodi*, much magnified. [*After Hirst.*

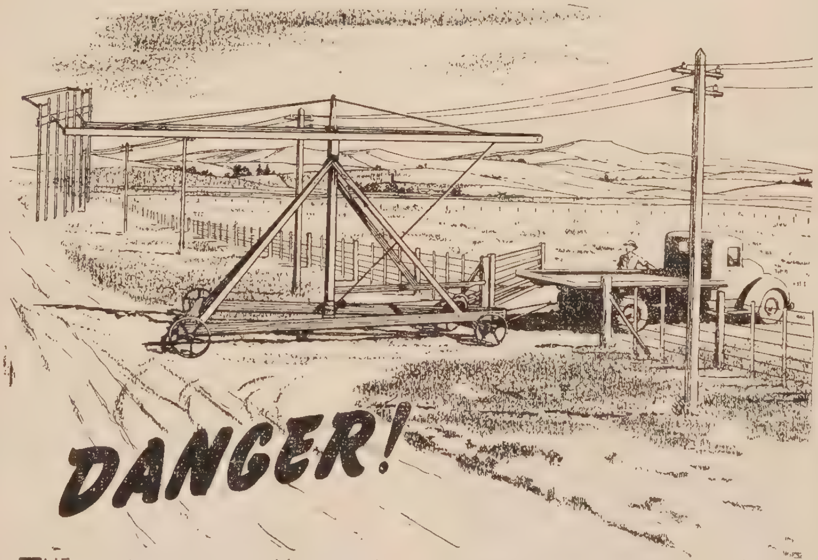
The lethal dose of arsenic for a bee is about .00005 milligram. One ounce of lead arsenate is sufficient to kill 120,000,000 bees

Diagnosis is carried out at Wallaceville, a large sample of bees (at least 500) being required.

### Isle of Wight or Acarine Disease

Fortunately unknown in New Zealand, Australia, Canada, or America, Isle of Wight disease or acarine disease is one of the most deadly bee diseases known in Europe and England, where it causes great losses. It is caused by a small mite *Acarapis woodi*, which enters the tracheae of adult bees through the prothoracic spiracles and weakens its hosts by feeding on their juices.

Now that air transport is available there is danger that Isle of Wight disease could enter New Zealand with imported queen bees. However, the Apiaries Regulations 1948, made under the Apiaries Act 1927, give power to prohibit the importation of bees except under certain conditions. The Department of Agriculture would not grant permits to import bees from any country or State where acarine disease of honey bees is known to exist, and any bees introduced without a permit may be seized and destroyed. In addition, queen bees which arrive from such countries must first pass through Wallaceville laboratory, where their escort bees are examined for Isle of Wight disease before the queens are dispatched to the apiarist who ordered them. If all escort bees are free from the disease, the queen is transferred to a new cage and provided with fresh escort bees before she leaves the laboratory. This eliminates the risk of the disease being brought to New Zealand.



THE greatest care possible must be taken that nothing touches any electric power line. It is not necessary to know the difference between the various types of electric lines—all are dangerous and contact with any may cause fatality. It is important that farmers particularly should be aware of the danger because, as reports of accidents show, it is in connection with the movement of farm machinery that fatal contacts with power lines occur all too frequently.

Farmers should make certain that no farm implement whether stationary or when being moved can touch electric lines. Before moving a stacker the jib should be lowered, and similar action should be taken with the upward projecting part of any other implement before it is shifted.

When repairing buildings farmers should keep clear of all electric lines and they should not hesitate to ask a supply authority to make its lines dead if work is to be done near the point where lines are attached to buildings.

Farmers should report anything unusual about electric lines or installations on the farm, or even the lines on the road. When any part of the installation becomes faulty it should be repaired by an electrician.

# Farm Dairy Instruction: Cleaning Milking Machines and Dairy Equipment

By W. G. BATT, Supervisor of
Dominion Farm Dairy Instruction,
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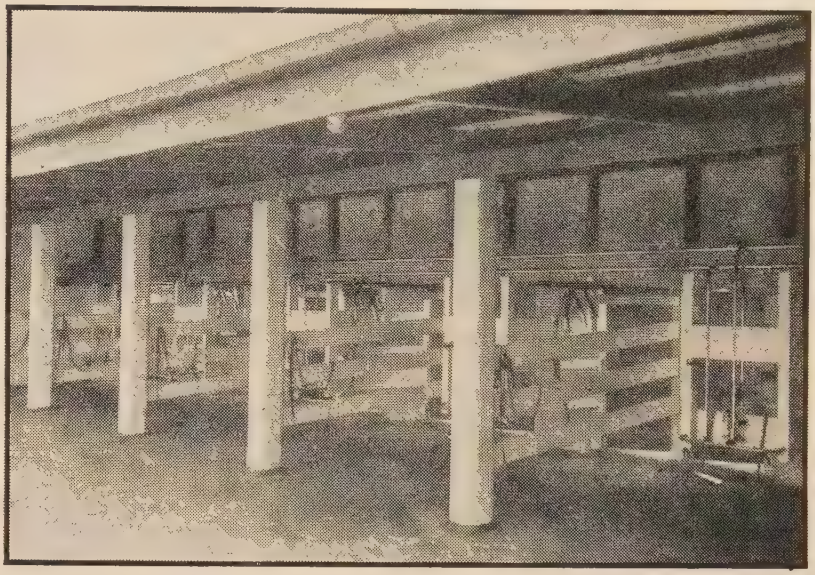
Hamilton.

**THE milking machine and other equipment provide a serious source of contamination if effective methods of cleaning and sterilisation are not followed. Research and practical trials have shown that the detergents and methods advocated in this article are best suited to New Zealand requirements.**



THE releaser type of milking machine, used by the New Zealand farmer, in which the milk is lifted to an overhead pipe by vacuum and released in a room separate from that used for milking, has considerably more metal and slightly more rubber than the bucket type of machine favoured in other countries.

It is difficult to formulate a complete method of cleaning the two component materials, metal and rubber, as a method best suited to cleaning metal may not be the best for rubber. For instance, regular brushing of metal is necessary to prevent the formation of encrustations of casein and minerals, but it will quickly destroy the surface of rubber and create conditions favourable to the harbouring of bacteria. Fat, including butterfat, is most destructive to rubber, and a detergent which will prevent milk film and deposits on glass and metal will not remove fat from rubber.

Milking machine rubberware will absorb fat rapidly; rubberware subject to pulsation will absorb half or more of its own weight within a relatively short period. Once fat is absorbed, destruction of the surface of the rubber begins and small cracks, which harbour bacteria, appear and get progressively worse until the rubber reaches a sponge-like condition in which it cannot be effectively cleaned or sterilised.

## Porous Material Harmful

It is most important to remember that for handling dairy produce the use of anything porous must be avoided at all costs, because porous material harbours bacteria and makes sterilisation difficult and often impossible; wood or concrete in contact with milk will harbour immense numbers of bacteria. Metal must be smooth and properly coated with tin, and rubber must have a smooth, hard surface, if the conditions under which these materials harbour bacteria are to be avoided.

Because the milking machine is comprised largely of metal and rubber, both materials must be considered in reference to cleaning methods.

Research and trials by the Dairy Division have had as their objective the formulation of a method which will prevent contamination from an accumulation of milkstone and mineral stone on metal, and intense contamination from deterioration of rubber by the penetration of fat.

As metal in good condition has a smooth, hard surface and presents no problem if simple cleaning methods (proper flushing, regular brushing, and sterilising with boiling water) are used regularly, the cleaning of rubber becomes the most important aspect. Rubber requires different treatment from metal, and usually it is the rubber parts of a milking machine which are found to be unclean because operators have not recognised the fundamental cause—absorption and penetration of fat. The objective should be to use a detergent and a method of cleaning which will retard the penetration of fat into rubber and the consequent destruction of its interior surface. Exhaustive trials, supported by analyses of rubber after use, show that an alkaline wash is best, the most effective detergent being caustic soda, not because of its strength as a cleanser, but because of its ability to remove all trace of fat by its power of binding fat particles.

The metal and rubber on a milking machine may be in good condition, but if proper cleaning methods are not used regularly or the cleaning procedure is unsatisfactory, contamination and consequent harbouring of bacteria will arise from two conditions: The formation of encrustation of milkstone and mineral stone on metal and the penetration of fat into rubber.

Milkstone is the casein of milk which has become attached to metal in the form of encrustations. It is caused by inefficient flushing of the milk from the equipment, the casein of the milk being burnt on to the metal by the heat generated by the subsequent boiling flushing solutions. Mineral stone is caused by small deposits of minerals common in some water lodging on metal. They occur first as sediment and finally become firmly attached by heat and a mixture of milk deposits, including fat.

These conditions, both of which are a serious contaminating influence, can be avoided by sufficient flushing and regular brushing.

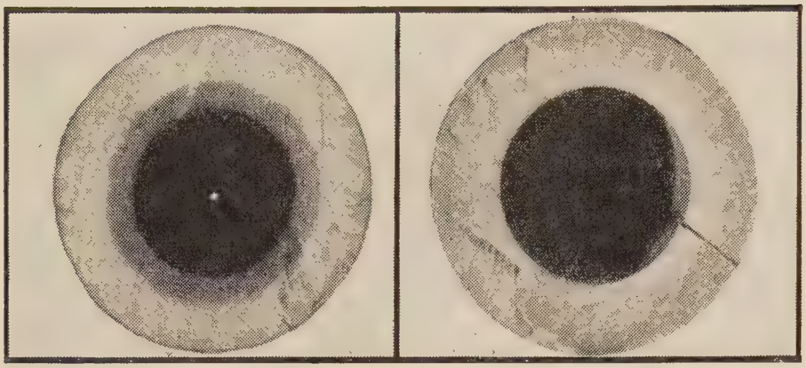
Rubber is not affected by milkstone because it does not absorb and hold heat as does metal. The rubber parts of a milking machine should not be brushed, because it is unnecessary and because the regular use of a brush will scratch and score the inside surface, assisting in the lodgment and penetration of fat and causing a porous condition, which should be avoided.

All metal parts used in handling dairy produce should have a bright, shining appearance. If dull, they are coated in deposits or have lost tinning. The former can be removed with spirit of salt, but metal devoid of tin must be replaced.

## Milking Machines

On the modern and larger milking machines a self-draining vacuum tank is fitted next to the vacuum pump to facilitate the cleaning of the milk and air systems by flushing. The top chamber of the releaser is filled with liquid by interrupting the releaser pulsator and the surplus taken to the vacuum tank, thus cleaning the vacuum piping in this section. The liquids are discharged by breaking the vacuum at any point on the machine, and the method has the advantages of conveniently flushing both the milk and air systems and of assisting to maintain the temperature of the solutions used.

A simple method of cleaning a milking machine is described in the following section of this article, but it must be practised regularly. Where this is

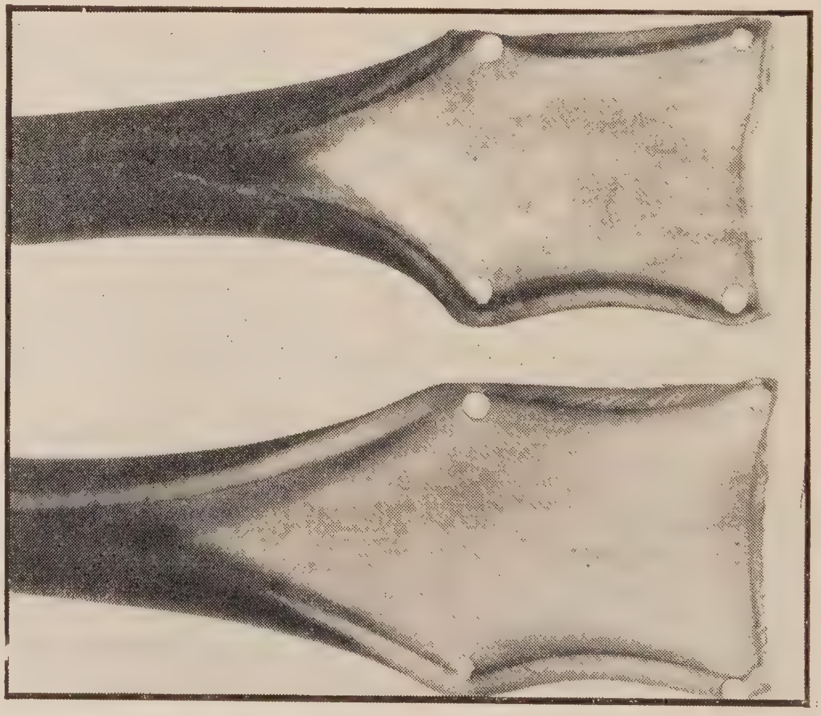


Left—End view of long milk rubber, after one season's use, perished by fat absorption. The dark inner circle indicates the depth to which fat has penetrated and the extent of perished surface. Right—End view of long milk rubber after four years' use and treatment by the boiling water-caustic soda method.

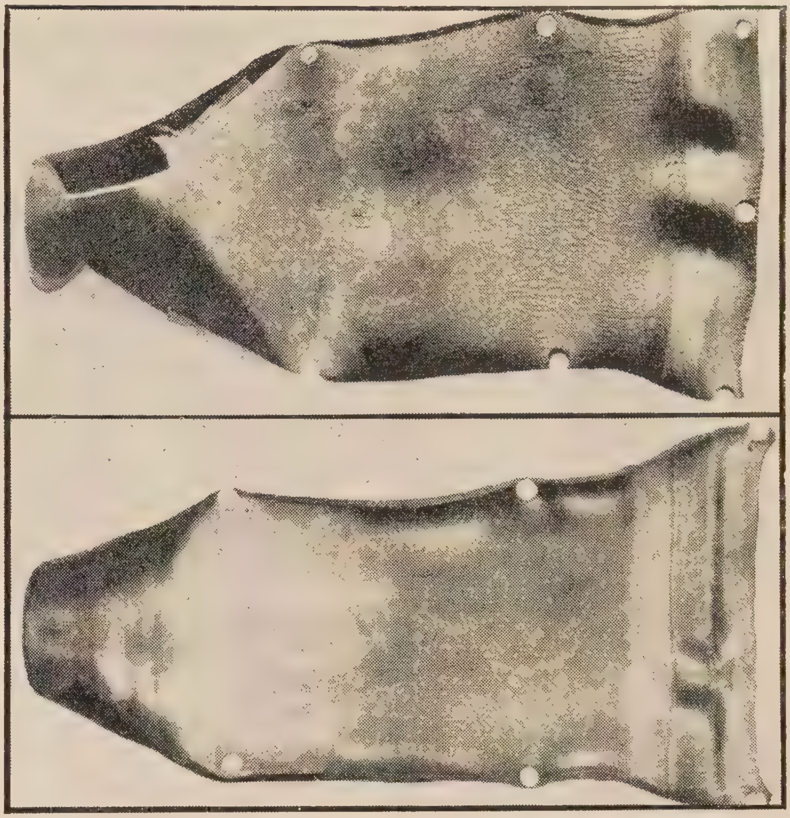
done stone will form on metal only in exceptional cases, and rubberware, with the exception of inflations, will remain effective and sanitary for up to 6 years. The steps in the cleaning of the machine are:—

1. Before milking is begun draw cold water through each set of teat cups. This will wet the parts and help to prevent milk film adhering to the metal. Lift the cups in and out of the water, allowing an intake of air to provide greater rinsing and flushing.
2. After milking remove all dirt from the outside of teat cups and claws by hand brushing them in a warm caustic soda solution.
3. Stop the releaser pulsator or disconnect the releaser rubber and draw one bucket of cold water through each set of teat cups. This will fill the releaser and remove milk deposits from all parts before the boiling solutions are applied. Lift the cups in and out of the water to allow an intake of air and to produce a surging effect. Insert in the main milk pipe a traveller brush or cleaner attached to a cord and allow it to travel to the releaser under vacuum. Draw it back against the air pressure to brush the pipe thoroughly. Break the vacuum to discharge the water from the releaser and vacuum tank.
4. Draw 1 gallon of boiling water and caustic soda solution at the strength of 1 level teaspoon of caustic soda to 4 gallons of boiling water through each set of teat cups. Lift the cups in and out of the solution to allow an intake of air and to produce a surging effect. Better results and greater sterilisation are obtained by immersing 2 sets of cups in the solution simultaneously. Break the vacuum to discharge the solution from the releaser and vacuum tank. (The solution from the releaser is discharged into a container and used for other purposes.)
5. Through each set of teat cups draw 1 gallon of clean boiling water. Lift the cups from the water first and once only to flush out the caustic soda solution. Generate the utmost heat and give the most effective sterilisation by leaving the cups immersed and preventing an intake of cold air. Turn off vacuum taps before removing the cups from the liquid. Better results and greater sterilisation are obtained by immersing 2 sets of cups in the boiling water simultaneously. Break the vacuum and discharge the water from the releaser and vacuum tank.
6. Treat the pulsator and vacuum systems in the same manner by drawing the solutions through the systems from the claw air rubber or from behind the inflations. The rubber connecting the releaser to the releaser pulsator must also have daily attention.
7. Brush the metal pipes regularly with a to-and-fro motion. A brush and cord, ball of horsehair and cord, or a rubber cleaner and cord are all suitable for cleaning the main milk pipe under vacuum.
8. Wash the outside of teat cups and rubbers with caustic soda solution collected from the releaser and rinse them. Disconnect them from droppers and hang them in a clean, dry place, protected from sunlight.
9. Scrub the releaser, vacuum tank, separator parts, and utensils with a brush and sterilise them in boiling water.
10. To allow a circulation of air remove all rubber plugs from piping and leave all ports and the vacuum tank open.

Analyses, following practical trial, have shown that the penetration of fat into rubber is very rapid and very considerable; milk elevator inflations have been found to absorb 6 per cent. (by weight) of fat in 2 months and teat cup inflations much more. Consequently, it is essential to remove all trace of fat after each milking, and tests have shown conclusively that completely satisfactory results can be obtained only by using the boiling water-caustic soda method twice daily. Analyses of rubber after the use of this method twice daily have shown no penetration of fat, but following its use during a comparable period once



Surface view of the rubbers shown at the top of this page. Note the perished surface of the upper rubber and the dark lines indicating fat penetration.



Upper—Teat-cup soft inflation, after 8 weeks' use, perished by fat penetration. Note the perished and cracked surface, which harbours bacteria. Lower—Teat-cup soft inflation after 18 weeks' use during which it was treated by the boiling water-caustic soda method.

daily penetration of fat has been considerable. When washing soda and similar cleansers were used absorption of fat increased greatly.

The primary objective in cleaning dairy equipment is to destroy bacteria and remove fat.

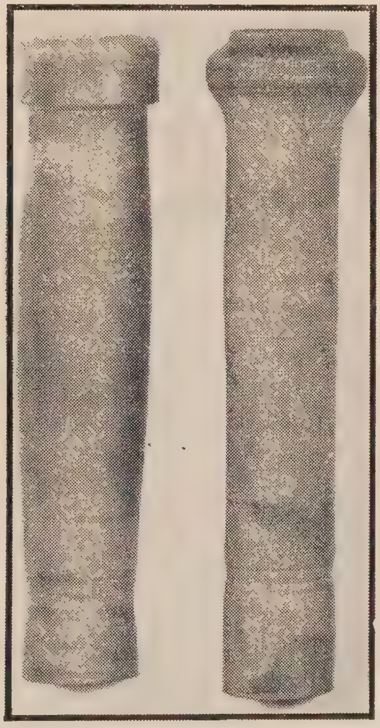
**Caustic soda is the only detergent which will effectively remove fat from rubber. It is also a germicide, and bacteria will be destroyed by its use and by sterilisation with boiling water.**

There are many cleansers, including washing soda, which are very effective as water softeners and are useful if used in conjunction with caustic soda, particularly where hard water is common, but they are not effective as sole cleaning agents.

With the exception of stainless steel all metals used in dairy equipment, unless properly coated with tin, are porous, and being porous they harbour bacteria and also impart metallic flavours. The effect of milk acids and long usage will cause tinning to be removed gradually and in this condition the metal has a highly contaminating influence. No bare metal should be used in handling dairy produce and all parts so affected must be retinned or replaced.

## Milk Pumps and Elevators

Inspection frequently reveals much more serious contamination in milk pumps and elevators and in the connecting pipes and rubbers than in the milking machine, and sometimes the last named is clean though the other parts mentioned are affected. An investigation has shown that this is due to the common fault of flushing these units and parts simultaneously with the milking machine and with the same solutions. Trial and experiment have shown that these devices can be kept in as clean condition as the machine if they are treated separately and with the same procedure.



Outside view of the inflations shown in the illustration at the top of the page. The bulging of the inflation on the left is due to absorption of fat.

All milk pumps and elevators at present on the market are regarded as satisfactory for their purpose, but one cleaning operation, by flushing the milking machine and milk elevator, is insufficient and unsatisfactory, chiefly because of the considerable fall in temperature of the solutions by the time they reach the milk elevation equipment. While the boiling detergents and rinses are under vacuum in the milking machine they maintain largely their efficiency, but as soon as they are released into cool air between the milking machine and milk elevator their power to cleanse and to remove fat is diminished and their value as sterilising agents is lost. The position is aggravated in cases where the solutions are allowed to run over a milk cooler before reaching the milk elevator.

The practice of taking milk elevators to pieces daily and cleaning the inflations and parts by hand is not recommended and the same methods and detergents as are used in cleaning the milking machine should be employed, using the following procedure:—

1. Draw 1 bucket of cold water through the milk elevator and its connections.
2. Put through ½ gallon of boiling water to which has been added caustic soda (1 level teaspoon to 4 gallons of water).
3. Rinse with ½ gallon of clean, boiling water.

**The important point is that this equipment must be treated independently of the milking machine.**

## Fittings on Milking Machines

Where a part of a milking machine is difficult to take apart it is usually found in an unclean condition because it is inconvenient to give it proper and regular attention.

The number of releasers unclean and coated in milkstone, especially in the top chamber, coincides with the number which are difficult to take apart

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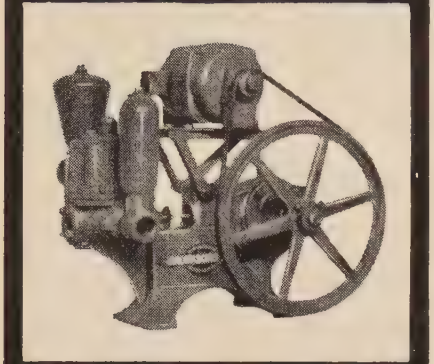

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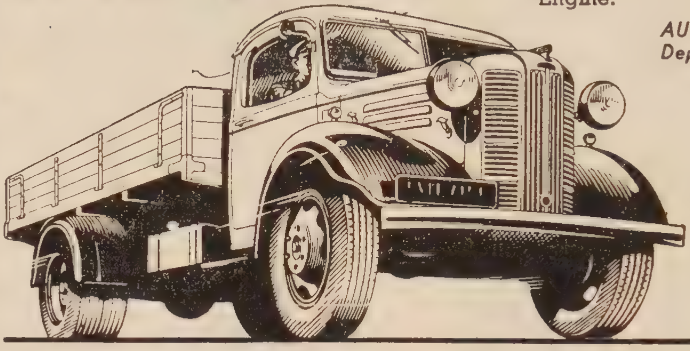

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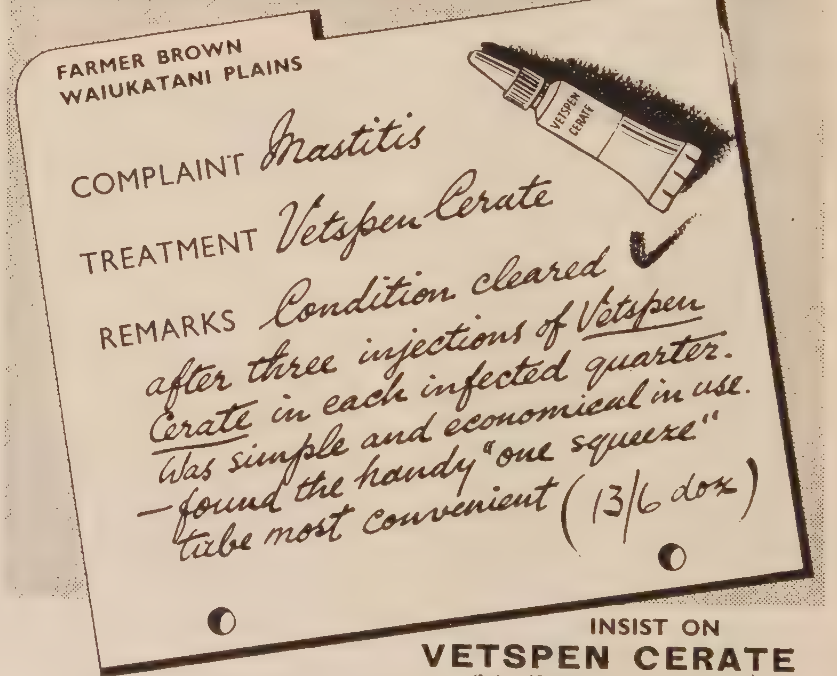

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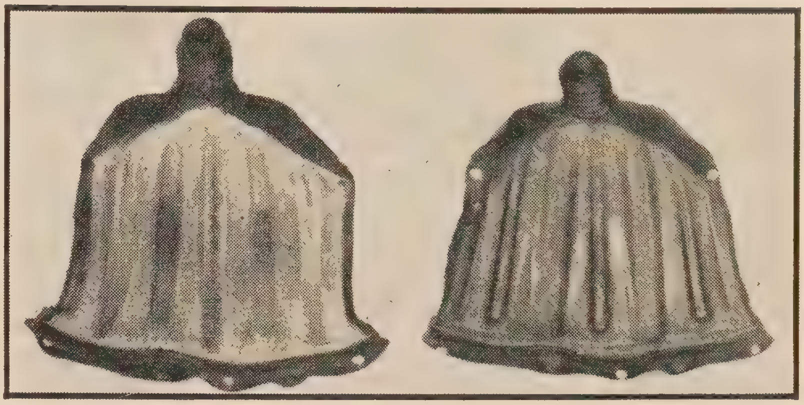
because of unsatisfactory unions connecting the releaser to the milk and air piping and to unsatisfactory releaser brackets.

The fittings used on milking machines, particularly the unions connecting the lengths of milk piping to each other and to the releaser, must be such that these parts can be taken apart conveniently. Many types of unions used on milk piping and releasers are unsatisfactory because spanners and tools have to be used to disconnect and take down these vital parts. The screwed, wing-nut type is favoured, as it can be loosened easily and conveniently without tools.

In their own interests farmers should insist on their milking machines being fitted with unions and brackets of a type which will facilitate the taking down of piping and releaser for regular inspection and cleaning.



Left—A hard-moulded teat-cup inflation after one season's use, showing perished surface due to the penetration of fat. Right—The same type of inflation as that at left after two years' use during which it was treated by the boiling water-caustic soda method.

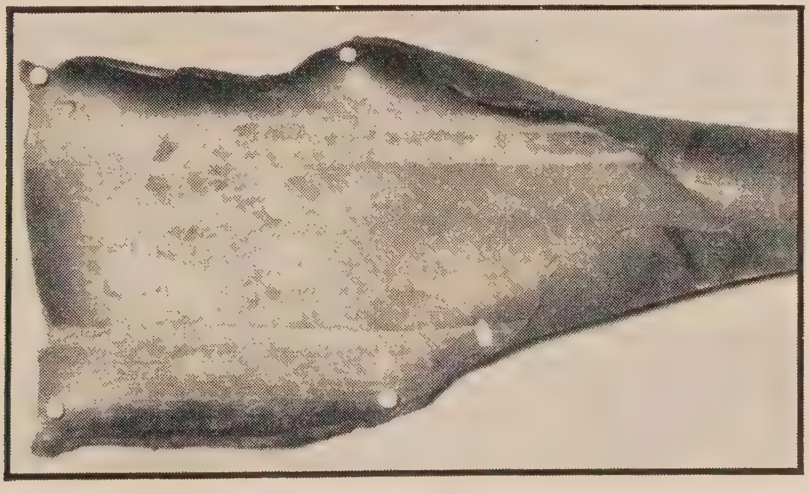
## Cleaning of 1-bail Bucket Machines

As 1-bail bucket milking machines have no releaser and no vacuum tank, there is no simple method of cleaning all parts by flushing and the methods advocated for machines of larger size must be modified slightly. The glass vacuum jar provided on most models has some value as a detector, but it has insufficient capacity to accommodate the liquids required to flush the air section adequately and there is a tendency for the glass, through expansion, to break when filled with boiling water. There is considerable contamination in the vacuum sections of these machines, owing to milk vapours being constantly drawn from the bucket through the vacuum rubber to the vacuum pump. Therefore, the rubber and vacuum jar require regular and thorough cleaning.

The milk system, comprising the teat cups and milk rubbers, should be treated by flushing to the vacuum bucket, using the same detergents and the same methods as recommended for larger machines. After this has been done the pulsation rubber leading from the cups to the pulsator and the vacuum rubber leading from the bucket to the vacuum jar should be disconnected, brushed in caustic soda solution, and rinsed. The glass vacuum jar is then taken apart and cleaned and the rubber ring washed in caustic soda solution to retard absorption of fat and replaced to prevent it from stretching. The teat cups and rubbers should be kept in a clean, dry place protected from sunlight and the glass jar and bucket on a clean bench in the open air.

## Separator Parts and Utensils

The separator parts, especially the discs, and the cooler, milk vat, and other utensils can be a source of considerable contamination unless effectively cleaned and sterilised. Unless fat is removed completely, very unsatisfactory flavours develop from oxidation and from the development of bacteria. No metal parts of this kind can be cleaned thoroughly without brushing and they must be scrubbed regularly with a hard brush. An alkaline wash is the most suitable for cleaning the equipment and one of the common preparations or washing soda is generally used. A soap solution is also useful, and a weak solution (1 level teaspoon to 8 gallons of boiling water) of caustic soda will give excellent results.



A milk-elevator inflation perished by fat penetration. Analysis showed that the rubber had absorbed 1.8 per cent. fat by weight in 2 months.

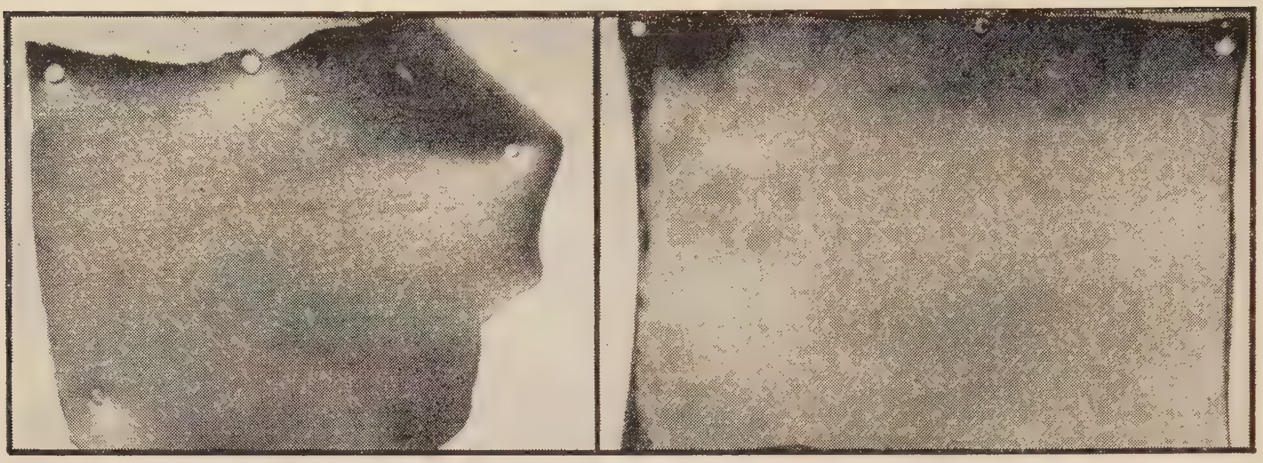
Good results are obtained by collecting and aggregating the caustic solution used in cleaning the milking machine with the boiling water used in flushing it. By the addition of the water used in the final flushing the strength of the caustic solution previously used in the milking machine is reduced from 1 teaspoon to 4 gallons of water to 1 teaspoon to 8 gallons.

All tinware and utensils after being scrubbed adequately in an alkaline wash must be sterilised. Boiling water is a suitable rinse and immersion in it will destroy bacteria. All metal parts should be kept on a clean, dry bench in the open air.

Because transport to the manufacturing dairy causes considerable agitation of milk and cream, it is essential that the cans used for this purpose should be properly and completely tinned and cleaned and sterilised effectively. Pitted metal in cans and incomplete sterilisation of them are the cause of much poor-quality produce. The can-washing machines of dairy factories are not intended to complete the cleaning of cans, which remains the responsibility of the supplier. Milk and cream cans must be scrubbed daily in an alkaline solution and sterilised with boiling water. After cleaning they should be kept in clean, fresh air to drain and dry completely.

## Appliances for Boiling Water

Almost all dairy farming districts are served by electricity and the electric cylinder is the most common appliance for boiling water. Coppers mainly are used in districts not connected to electric supply systems. Whatever appliance is used it is essential that it should produce boiling water when cleaning of equipment is to begin. The copper boiler, properly bricked in and under cover, is particularly useful where fuel is plentiful,

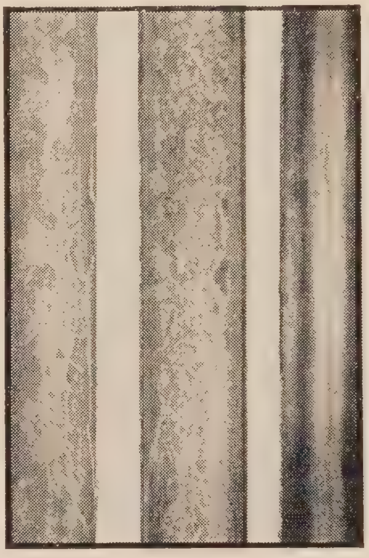


Left—A milk-elevator inflation perished by fat penetration. Note the cracked and perished surface, which harbours bacteria. This inflation was washed by hand twice daily. Analysis showed that it had absorbed 5.8 per cent. of fat by weight in 2 months. Right—Another inflation from the same elevator, treated by the boiling water-caustic soda method. Analysis showed that after 18 months' use it contained no trace of fat.

as adequate boiling water is available at any time and it provides a means for the sterilisation of utensils by immersion.

Electric water-heating appliances are simple and convenient, but the capacity of the cylinder and of the element must be sufficient to provide boiling water by the time it is required. This is not always possible during periods when electricity must be conserved; then it becomes necessary for the operator to adjust the intake of cold water to the cylinder to the reduced supply of electricity.

**Warm or hot water, however plentiful, is useless for sterilising milking machines and dairy equipment, and if there is not sufficient power to bring the water to boiling point it will be more satisfactory to reduce the quantities of water recommended for cleaning to ensure that the supply from the cylinder reaches boiling point at the required time. A small quantity of boiling water will destroy bacteria; a large quantity of hot water will not.**



Three sections of milk piping. Left—Heavily coated with milkstone and mineral stone. Middle—Coated with milkstone. Right—Pipe after treatment as recommended in this article.

## Removal of Milkstone and Mineral Stone

Encrustations of milkstone and mineral stone are a serious contaminating influence, because they harbour bacteria and prevent effective cleaning and sterilisation.

The number of milking machines affected by milkstone and mineral stone coincides with the number not equipped with brushware. The contaminating influence of the encrustations and the difficulty and inconvenience of removing them from milking machine piping can be obviated by regular flushing and brushing. Where the piping and metal parts of a milking machine or the metal of other equipment is not bright and smooth and is coated in these deposits all such encrustations must be removed if the quality of dairy produce is to be protected. Any powerful acid will soften the deposits, but experience has shown that a weak solution of hydrochloric acid (spirit of salt) is the most suitable. The procedure is as follows:—

1. Dismantle the piping and plug one end of each length.
2. Pour into each length in turn 1 breakfast cup of a solution of spirit of salt and cold water (1 part spirit of salt and 2 parts water) and plug all inlets.
3. Allow the solution to remain until the deposits are softened. This will require half an hour or more, and the piping should be turned occasionally to spread the acid over the whole surface.
4. Remove the deposits, when softened, with a hard brush and immerse the piping or metal parts immediately in an alkaline solution (washing soda or caustic soda is suitable) to neutralise the acid and prevent damage to the tinning. Rinse with clean, boiling water.

Separator discs and parts, releasers, milk vats, and coolers, are treated in the same manner, but the acid solution is applied with a soft brush or cloth. Properly treated, piping and metal parts should be clean and bright and will remain in this condition if the cleaning methods recommended are followed regularly.

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# Preparation of Seed-beds for Autumn-sown Grass

SEASONAL NOTES

Contributed by the

EXTENSION DIVISION

SUMMER fallowing preparatory to the sowing of permanent pastures in autumn is now fairly common in New Zealand. It is often carried out in the all-grass farming districts of the North Island when worn-out permanent pastures are renewed by the grass-to-grass method, and in arable farming districts when the aim is a firm, moist seed-bed for late-summer or early-autumn sowing.

To secure full benefits from the drainage of heavy land it is usually necessary to plough under the old turf and resow the land to grass. Sowing after a summer fallow is the best method.

ONE weakness of the grass-to-grass method of renewing pastures in the North Island is that the seed-bed is not firm and clovers do not strike if the preparatory cultivation is delayed until just before the seed is sown. On light land the requisite degree of firmness may be obtained with repeated heavy rollings, but on heavier land natural consolidation through fallowing is necessary to give a firm and moist seed-bed.

## Most Certain Method

The grass-to-grass method of renewing permanent pastures is best carried out by shutting up the field for an early crop of silage and then ploughing in late November or early December while the land is still moist. As much land as is ploughed each day should be surface cultivated with harrows and discs so that it is broken down while moist and not allowed to bake and harden in the sun. During the summer the land should be worked periodically, and the several months of fallow will allow complete rotting of the turf and the formation of a moist and firm seed-bed for early-autumn sowing.

Taking a summer fallow is the most certain method of securing a satisfactory strike of grasses and clovers, because the fallow brings the land to a high state of fertility; it is then rich in available nitrogen and is moist and firm. After a fallow pasture seed may be sown as early as the occurrence of rains in late summer and early autumn allows. As the soil temperature is high in late February and early March, grass and clover plants make rapid growth and the first feeding off may be obtained in late autumn before the land becomes wet and stocking difficult.

## Renewing Inferior Pastures

Renewal of inferior permanent pastures on ploughable land offers considerable scope for increasing primary production. Large areas of the 7 or 8 million acres of land sown to grass after being ploughed were established before supplies of Certified pasture seeds were available, and probably 2 to 2½ million acres are in inferior swards which, even with regular topdressing, are not capable of maximum production unless high-producing strains of perennial ryegrass and white clover are introduced. Fertilisers and seed are now available for an expanded pasture-renewal programme, but as labour, seed, and fertilisers are costly, renewal is warranted only if the new pasture is better than the old.

**Faulty seed-bed preparation causes many failures. If the seed-bed is not firm, moist, and warm, the strike is poor and gives an unsatisfactory basis for a productive pasture.**

## Three Main Methods

There are three main pasture-renewal methods: Surface cultivation followed by broadcasting of seed and fertiliser; ploughing and direct reseeding; and sowing to grass after the taking of a fodder crop.

Surface cultivation and seeding succeeds only where the lightly-broken surface soil provides a satisfactory seed-bed. It is most successful on light, moist soils, but may not be at all satisfactory on pastures with a complete turf which the surface cultivation does not open up sufficiently or where the surface soil is naturally hard and dry.

Breaking out of grass, taking a fodder crop, and then resowing to grass is satisfactory provided that the pasture may be spring sown after a winter forage crop or, if taken after summer forage, that the crop is off the land early enough to allow early-autumn sowing. However, spring sowing is not suitable in many districts, and rape and soft turnips are usually the only summer fodder crops that are finished early enough to allow early-autumn sowing.

Sowing after a summer fallow is probably the surest method of providing the firm, moist, and warm seed-bed required for autumn grass sowing.

## Centuries-old Procedure

The summer fallow is, of course, the oldest known method of soil-fertility maintenance and was used for many centuries to maintain cereal production on arable land. It still has its uses for this purpose, and a recent survey of wheat production in the vicinity of Christchurch showed differences in yield of up to 38 bushels per acre between wheat crops taken after a summer fallow and those that were not.

Its value to grass is similar to its value to a cereal: Soil fallowed during summer is enriched in nitrogen, and consequently the initial growth of the young grass is vigorous.

# PREPARING FOR THE MAIN HONEY FLOW

## Seasonal Notes for the Domestic Beekeeper

**CAREFUL and diligent management will be necessary during the month to ensure that the maximum of field bees are available for foraging work just before the main honey flow begins.**

[*Rendell's Photo Service photo.*
Placing the super in the correct position above the queen excluder.

TO ensure that brood production is kept at its absolute maximum at this time of the year it is essential that the hive be headed by a strong, vigorous queen and has ample supplies of both stores and pollen.

**The amount of surplus honey gained each season is governed largely by the production of brood in the hive 6 to 8 weeks before the start of the main flow.**

If necessary, brood rearing may be stimulated by feeding small quantities of sugar syrup in the proportion of 2 parts of water to 1 part of sugar.

If the amount of brood in the hive is not as great as expected, the beginner sometimes has the impression that the queen is failing. Although queens often fail at this important period of the year, this is not always the reason for the lack of brood. A common cause in domestic apiaries is that combs are full of pollen and honey, thus preventing the queen from laying. Although laying room can be given by providing an additional super and lifting the combs of honey out of the brood nest and replacing them with foundation and empty combs, care should be taken to see that the brood is not separated to any great extent, as a sudden change in weather may cause chilling of the brood and a serious setback to the colony.

If it is considered desirable, medium-strength colonies can be given added stimulation by transferring surplus frames of brood from stronger hives. In the reverse manner a weaker colony which will not build up to sufficient strength in time to catch the main honey flow may be reduced to a nucleus, and all surplus brood used for building up other hives in the apiary. When carrying out these manipulations extreme care should be taken to ensure that all brood transferred in this manner is taken from disease-free hives.

[*Rendell's Photo Service photo.*
Method of examining interior of a hive.

### Supering

If foundation is used in supers, the endeavour should be to alternate with combs of honey or drawn combs, but if this is not possible, it is most desirable that there be 10 foundation frames in the super. The beekeeper should realise that bees, to secrete wax, must cluster for heat and they are enabled to do this much more readily when the frames are closer together. If the flow has started, one frame can be withdrawn when all the foundation comb has been drawn out by the bees.

When colonies are in need of further room to provide additional storage space they should be given one super at a time. If two or more supers are added, there is a possibility of honey being stored in a few frames in each box, thus causing more work for the beekeeper.

To prevent the queen laying in the supers, an effective check is sometimes obtained by placing in the super directly above the brood nest combs filled with honey. However, this method is not altogether reliable and it is therefore advisable to make use of a good queen excluder.

In many districts there is a break in the nectar flow this month, and if hives are full of brood, stores are rapidly used; unless the stores are watched carefully, there is a great danger of the bees dying from starvation.

—*R. GODDARD, Apiary Instructor, Department of Agriculture, Tauranga.*

# METEOROLOGICAL RECORDS FOR SEPTEMBER

| Station | Height of station above M.S.L. (ft.) | Air temperatures in degrees (Fahrenheit) | | | | Rainfall in inches | | | | | Bright sunshine hours |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Approx. mean | Difference from normal | Absolute maximum and minimum: Maximum | Absolute maximum and minimum: Minimum | Total fall | No. of days of rain | Difference from normal | Maximum fall: Amount | Maximum fall: Date | |
| Kerikeri .. .. | 201 | 53.5 | + 1.1 | 67.0 | 38.5 | 2.59 | 11 | | 0.44 | 12 | 176.6 |
| Auckland .. .. | 160 | 55.0 | + 0.5 | 65.6 | 40.8 | 2.04 | 14 | — 1.94 | 0.60 | 18 | 154.1 |
| Tauranga .. .. | 10 | 52.4 | + 0.0 | 67.0 | 32.9 | 4.56 | 13 | + 0.37 | 2.31 | 18 | 200.5 |
| Ruakura .. .. | 131 | 50.2 | — 1.3 | 66.8 | 27.8 | 1.22 | 10 | — 2.60 | 0.38 | 16 | 164.4 |
| Rotorua .. .. | 980 | 49.6 | + 0.1 | 65.0 | 26.0 | 5.29 | 10 | + 0.40 | 3.17 | 18 | 180.0 |
| Gisborne .. .. | 12 | 51.4 | — 0.7 | 68.8 | 32.0 | 2.22 | 11 | — 0.36 | 0.95 | 13 | 192.1 |
| New Plymouth .. | 160 | 51.0 | — 0.5 | 64.2 | 31.9 | 3.25 | 18 | — 1.73 | 0.68 | 17 | 148.7 |
| Napier .. .. | 5 | 51.6 | — 0.2 | 66.8 | 30.2 | 1.03 | 6 | — 0.98 | 0.39 | 19 | 208.7 |
| Taihape .. .. | 2157 | 45.4 | — 0.4 | 59.9 | 25.7 | 2.40 | 17 | — 0.76 | 0.40 | 18 | |
| Wanganui .. .. | 72 | 50.7 | — 0.8 | 66.2 | 33.0 | 1.60 | 16 | — 1.27 | 0.46 | 19 | 155.0 |
| Palmerston North | 110 | 50.0 | — 0.3 | 65.5 | 29.8 | 1.42 | 13 | — 1.66 | 0.40 | 26 | 154.7 |
| Waingawa .. .. | 350 | 48.6 | — 0.7 | 67.7 | 25.5 | 1.52 | 12 | — 1.96 | 0.63 | 19 | 195.6 |
| Wellington .. .. | 415 | 49.9 | — 0.2 | 63.8 | 34.6 | 2.01 | 12 | — 1.64 | 0.47 | 8 | 201.4 |
| Nelson .. .. | 24 | 50.6 | + 0.3 | 66.3 | 31.3 | 1.12 | 11 | — 2.36 | 0.28 | 11 | 203.7 |
| Blenheim .. .. | 12 | 50.0 | — 0.5 | 68.4 | 28.2 | 0.77 | 5 | — 1.55 | 0.27 | 16 | 212.9 |
| Hokitika .. .. | 12 | 46.8 | — 1.3 | 59.8 | 29.9 | 6.12 | 14 | — 2.90 | 1.18 | 7 | 161.3 |
| Hanmer Springs .. | 1225 | 46.2 | + 0.3 | 70.0 | 21.0 | 1.25 | 9 | — 3.34 | 0.37 | 13 | 184.8 |
| Christchurch .. | 22 | 48.6 | — 0.1 | 72.5 | 25.3 | 0.29 | 5 | — 1.72 | 0.18 | 29 | 192.1 |
| Ashburton .. .. | 323 | 48.1 | + 1.1 | 76.8 | 25.0 | 0.61 | 7 | — 1.95 | 0.19 | 1 | 189.0 |
| Timaru .. .. | 56 | 47.4 | — 0.4 | 71.2 | 25.4 | 0.17 | 2 | — 1.74 | 0.14 | 12 | 175.2 |
| Alexandra .. .. | 520 | 47.9 | + 1.1 | 71.8 | 27.0 | 0.24 | 5 | — 0.57 | 0.12 | 18 | 193.4 |
| Taieri .. .. | 80 | 46.4 | — 1.3 | 75.7 | 25.9 | 1.02 | 13 | — 1.05 | 0.37 | 11 | |
| Invercargill .. | 32 | 45.8 | — 1.1 | 64.0 | 26.0 | 3.13 | 17 | — 0.30 | 0.85 | 27 | 132.9 |

# Planning for Next Spring in the Flower Garden

**THE successful gardener always plans his work well ahead, and to ensure that the flower garden will be well furnished with plants that will make seasonal displays preparations should be made fully 12 months in advance. Now that the summer- and autumn-flowering subjects have been planted out immediate thought should be given to the provision of plants required to furnish beds and borders with colour during next winter, spring, and early summer. That is the main theme of this month's article for the flower gardener by M. J. Barnett, Director of Reserves to the Christchurch City Council.**

[*Douglas Elliott photo.*

During the past few decades many new rhododendrons, including hybrids, have been brought into cultivation. Some gardeners are often tempted to try something new at the expense of the old and tried. *Rhododendron fragrantissimum* is not a new hybrid, but it is still one of the best and well worth a place in any garden. Provided it is given a lime-free soil, reasonably rich in organic matter, and a position sheltered from cold and parching winds, it will succeed in the average garden and will prove hardy in most districts. The large white flowers, faintly tinged with pink on the reverse, are, as the specific name suggests, deliciously fragrant. One advantage of this rhododendron is that it does not flower early and so escapes many of the late frosts which frequently play havoc with the earlier kinds. As the bushes do not reach large dimensions, it is a useful subject for the small garden.

IN addition to such bulbous plants as hyacinths, tulips, and narcissi, which are now resting, several of the biennials and plants treated as biennials are excellent for this purpose. Among the foremost of the biennials, the wallflower, which may be obtained in a variety of colour and form, is one of the best for most districts.

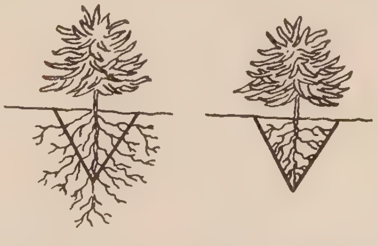
## Wallflowers

Perfectly hardy and easily raised from seed, the wallflower, though one of the oldest plants in cultivation, is still popular, both for its colouring and for the fresh fragrance of its flowers. To obtain healthy, well-grown plants to be planted out in April and May and to flower profusely during September and October, the seed should be sown not later than the first week in December. The seed germinates readily and no special precautions are necessary in its treatment. In districts not subject to long spells of dry weather the seed may be sown broadcast or in drills in a prepared bed in open ground.

To prevent the surface soil from drying out rapidly under the influence of wind and sun after the seed has been sown, light boughs of brushwood can be laid on the ground to prevent the evaporation of moisture and so assist germination. A simple contrivance which serves the same purpose is a framework of 6in. x 1in. timber placed round the sides of the bed with light scrim stretched over it to provide shade; in dull or wet weather the scrim can be rolled up and removed. As soon as the young seedlings appear above the ground the covering should be removed—not competely at first but gradually, leaving it on during the hottest hours of sunshine for the first few days.

Where only a few hundred plants are required the seed may be sown in a drill in the same way as turnip seed. However, if it is sown too thickly, the young plants will become drawn and leggy, and such plants are more difficult to transplant than those of a sturdier habit. In districts where days and even weeks may pass without rain and where the surface soil dries out rapidly, greater success is obtained by sowing the seed evenly and thinly in seed boxes in a frame where they can receive the necessary watering and shading.

By early January the young plants will have grown sufficiently to warrant their being transplanted to open ground in rows 12in. apart with 12in. between plants. If possible, a dull day should be chosen for the transplanting, and each plant should be given a good watering to settle the soil more firmly about the roots and to assist it to recover from the check it has received. However, the plants recover quickly, and in normal circumstances all that is necessary is to keep the hoe going sufficiently to keep down weeds and to prevent the surface soil from forming a hard crust.



The effect of wrenching wallflowers. Left—Spade cuts made through the roots. Right—The roots a few weeks after being wrenched.

Like most plants, the wallflower has its natural enemies. Grubs of the white butterfly and the diamond-backed moth attack it, but these pests can be checked easily by spraying the plants once or twice with a solution of arsenate of lead. Mildew sometimes attacks the foliage, and the best preventive is spraying with lime sulphur.

During February and March the plants will make rapid growth, particularly if rains are frequent, and sometimes they tend to grow long and soft instead of forming sturdy, bushy specimens. Toward the end of March the plants should be wrenched in the following manner: A

In favourable circumstances and given the right treatment, most of what are known as winter-flowering pansies and violas will flower throughout the winter, and all of them will flower profusely during spring.

few inches from the base of the plant a clean, sharp spade is driven into the ground with the blade at an angle of about 45 degrees. The operation is usually, and more effectively, carried out by two persons working in unison, one on either side of the row. The blades of the spades should meet between 6 and 8in. below the surface, thus completely severing the outward- and deep-growing roots. To complete the job, a downward cut is made with the spade between each plant and its neighbour.

**Wrenching not only induces the plants to develop a more fibrous root system, thus enabling them to be lifted later with a ball of earth attached, but also checks the growth, causing it to become more firm and compact.**

Wrenching usually is carried out after a good rain when the soil is moist, and in such circumstances the plants will recover quickly, but should conditions be less favourable, a dull day should be chosen for the operation, the soil heeled after the cuts have been made, and the plants given a good watering. Wrenching causes the plants to wilt, especially under the influence of bright sunlight, but usually they recover within a few days.

The wallflower belongs to the same natural order as the cabbage family (*Cruciferae*) and, like the cabbage, it is subject to club root disease. To prevent the soil becoming infested with this fatal disease it should be treated with a dressing of lime before sowing and before planting.

## Pansies and Violas

Many seedsmen now catalogue what are known as winter-flowering pansies and violas. In favourable circumstances and if given the right treatment, most of them will flower throughout the winter, but all of them will flower profusely during spring. The seed of these kinds should be sown in boxes or trays as described for wallflower seed. When the seedlings are large enough to be handled they should be pricked out into boxes containing a richer compost and grown on without a check until April, when they will be ready for transplanting to the beds or borders where they are to flower.

Both pansies and violas prefer cool conditions, and during summer they should be grown in a position where they are partially shaded from sunshine. On the other hand, to induce them to flower during winter they should be transferred to a warm sunny position.

## Daisies

The common lawn daisy—the "wee, modest, crimson-tippéd flower" immortalised by the poet Burns and the "cursed weed" of the groundsman—like many another lowly plant has received the attention of plant breeders. By selection and breeding they have evolved a type much in advance of its progenitor. The double or *monstrosa* varieties of *Bellis perennis* are procurable in white, red, pink, and salmon.

For edgings, for small beds, and for grouping in front of flower borders they are most useful and are among the hardiest of spring-flowering plants. They should be given the same cultural treatment as that recommended for pansies.

**They have one disadvantage, however: If planted alongside a lawn, seed from them invariably grows among the grass, where in the struggle for existence they quickly revert to type and become the "cursed weed" once more.**

## Forget-me-nots

Seed of forget-me-nots, or myosotis, should also be sown toward the end of December. The seed is sown in boxes, and when the seedlings are large enough to be handled comfortably they are pricked out or transplanted into other boxes or "flats." The plants make rapid growth and, if left in the boxes, would soon crowd each other. To overcome this difficulty the young plants are put out 6in. apart in rows 12in. apart in open ground. About the end of April they will be ready for transplanting to their flowering quarters. Unlike the wallflower, the myosotis does not require wrenching.

A well-grown bed of tulips is a lovely sight, but tulips rising above a groundwork of blue myosotis are even lovelier.

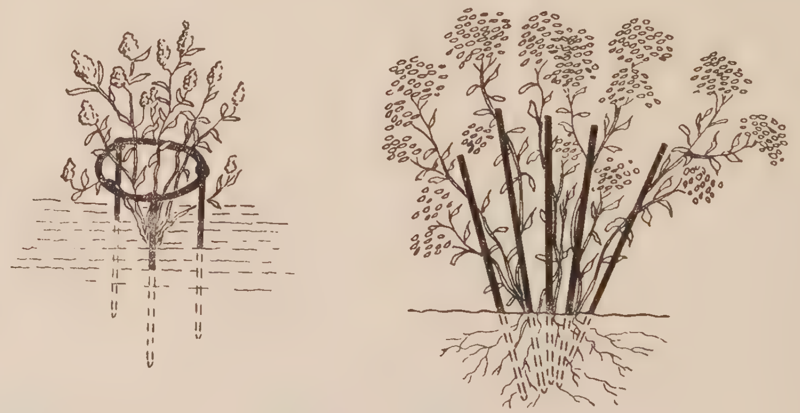
## Foxgloves and Canterbury Bells

The foxglove (*Digitalis*) is a noxious weed in the fields, but when given the right situation in a flower garden it is a stately flower. In a large hall a bowl of the flowers is most effective. Such varieties as the Shirley hybrids, Giant Primrose, Apricot, and Giant Spotted certainly are worth growing and appear to advantage when planted in groups at the back of a spacious flower border, in open spaces among the taller shrubs in a shrubbery, or in the wild garden—if the gardener is fortunate enough to possess such a place.

Canterbury bells (*Campanula medium*) are old favourites and may be obtained in single, cup-and-saucer, and double varieties, and in white, mauve, blue, and pink shades. Foxgloves flower during December and Canterbury bells toward the end of the month—when they are most useful for Christmas decorations. The seed of both should be sown during December and grown on in boxes in readiness for planting in autumn in the positions in which they will flower. Both foxgloves and Canterbury bells are true biennials, and to make sure that they will produce good blooms the plants should be well grown and transplanted to their flowering quarters during April so that they will have every chance to recover and establish themselves before the cold of winter sets in.

## Stocks

Seed of early-flowering stocks such as the Beauty of Nice varieties should be sown now. Results will be better if the seed is sown where the plants are to flower, but a vacant piece of ground in the flower garden is not always available at this time of the year, in which case the seed may be sown in boxes and the plants put out where required later in the season, when some of the summer-flowering



Left—A useful type of wire support for medium-sized herbaceous plants. Right—A method of staking a plant such as the michaelmas daisy.

subjects have had their day and can be removed. For winter and early-spring flowering, stocks should be given a warm, sheltered, well-drained situation. In Britain, where winters are more severe, stocks are frequently grown on in pots and flowered in a greenhouse during winter.

**None of the species mentioned requires artificial heat to assist the seed to germinate. Despite what has been said to the contrary, all of them may be raised successfully in open ground if reasonable care is taken with watering and shading. However, frequently it is more convenient and results are better if they are raised, in the initial stages at least, in seed trays in a cold frame where they can receive more regular attention.**

## Other Work for December

As the longest day approaches and warmer and more settled weather may be expected the more tender annuals, such as zinnias and celosias, can be planted out safely. Both grow best in a rich, warm soil, well sheltered from cold winds.

Cannas are always admired, both for their bold, handsome foliage and for the beauty of their flowers. In the warmer parts of the Dominion no difficulty is experienced in growing them to perfection; in the cooler districts more care is required. The plants should be given protection during the early stages of their growth and transferred to the open at this time of year, when the temperature of both ground and atmosphere is warmer. Where hard frosts are experienced, the crowns should be lifted in autumn and stored for the winter in a frost-proof shelter. Cannas will not tolerate dry conditions at the roots and grow best in a rich loam.

Most gardeners are familiar with the fibrous-rooted begonias for bedding purposes, but the tuberous-rooted varieties are much more handsome and more effective. Though the better and more expensive varieties are grown in pots for greenhouse decoration, many of those of less importance—particularly the ones with upright flowering stems and short joints—are suitable for growing in the open in favourable situations during summer. When well grown and in full bloom they make an arresting display. The plants are grown under glass during spring and early summer, gradually hardened off, and transferred to the open during December. The soil can hardly be too rich for them, but they must have shelter from cold and parching winds. Strong sunlight sometimes has a slight burning effect on blooms and foliage; to overcome this an old practice, but still a good one, was to plant the begonias underneath standard fuchsias, which gave protection from both wind and sun.

Such annuals as *Phlox drummondi* and verbenas will be making rapid growth, and for best results from them the long growths should be pegged down to the surface of the soil. This not only prevents them from becoming leggy or spindly and likely to be damaged by wind and storm, but induces them to develop more lateral growths, thus prolonging the flowering period. Pegs can be made of thin galvanised wire.

## Plants under Glass

At this time of year glasshouses require some form of shading to keep down the day temperature and to give some protection from the burning rays of the sun. Frequent syringing with water is necessary to moisten the atmosphere and to assist in combating attacks of thrips and red spiders, both of which seem to revel in a dry atmosphere. Plants attacked by these pests soon become disfigured and debilitated.

One of the most colourful of greenhouse flowering plants is the calceolaria. To provide plants that will flower during September, October, and November of next year seed should be sown now. Calceolarias are not difficult to grow, but they must not be neglected at any period of their growth. From the time of sowing the seed up to and including the flowering period they must be given an even temperature and careful attention to maintain them in a flourishing condition. To prepare for the sowing of the seed a pot or pan should be filled with a moderately-rich and porous compost, made firm but not hard, and the surface finished off perfectly even and level. Over the surface a little sharp sand is sprinkled and the seed—which is very fine—sown and covered with the merest dusting of fine compost; before the seed is sown it is a good plan to steep the pot containing the compost in water until moisture begins to show on the surface. The pot is then stood in a shady part of the glasshouse away from draughts and covered with a piece of glass to prevent rapid evaporation of moisture. The glass should be removed each day, all moisture wiped off, and the glass replaced. The seed should germinate within a fortnight when the glass is removed, but the immature plants must not be exposed to strong light or to sudden changes of temperature. When the young seedlings are large enough to be handled with care they are transplanted to seed trays, from which, when large enough, they are potted singly into 4in. pots and finally into 6in. ones. Throughout their cultivation calceolarias grow best in a cool, even temperature, and they must not be allowed to become dry at the roots. They are very susceptible to attacks of greenfly and every precaution should be taken to prevent these pests appearing in the house.

It is not too late to sow a second batch of cinerarias for flowering in the greenhouse during next spring. Plants from the first sowing required for winter flowering should be sufficiently advanced to be pricked off into trays. Those that are large enough can be potted up into 4in. pots.

[*Douglas Elliott photo.*

Funkias as a class are handsome, deciduous, herbaceous perennials, admirably adapted for growing in a bog garden or in cool, damp, shady situations. They may also be used to advantage in the flower border and, if given a suitable situation, make an effective edging. The plants grow best in a deep, rich soil, and the variegated forms require partial shading from strong sunlight or they are likely to suffer from sun-scorch. In addition to the bold, handsome, plantain-like leaves, the racemes of flowers varying from white to lilac are also attractive. The species illustrated, *Funkia lancifolia* var. *undulata*, has crisped or undulating leaves heavily variegated with patches and streaks of white. All the funkias may be propagated easily by dividing the crowns when the plants are dormant or just as young growth starts in spring.

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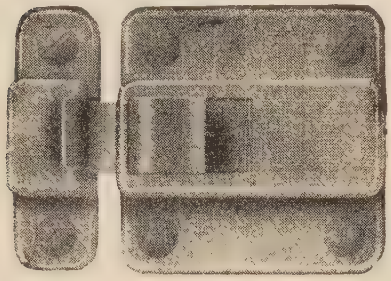

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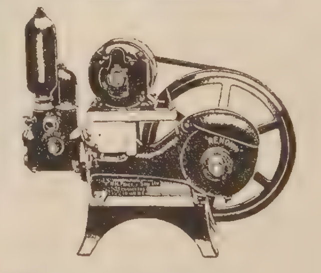

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# FIRST CONFERENCE OF COUNTRY GIRLS' CLUBS

**AT the first annual general meeting and conference of the Federation of Country Girls' Clubs at Godley House, Diamond Harbour, Lyttelton, during August 36 club members and 4 advisory members represented all clubs but two and came from as far north as Kaukapakapa, north of Auckland, and from as far south as Arno in South Canterbury.**

THE federation is often known as the sister organisation of the New Zealand Federation of Young Farmers' Clubs. When country girls sought to join young farmers' clubs 3 years ago the young farmers responded by helping them to form a similar organisation for girls between the ages of 14 and 30. The first club was formed in 1946. Growth in the number of clubs has been slow, but since May, 1949, there has been a marked increase. Most clubs are in Canterbury, but others are in widely-scattered parts of the North Island. The federation was established in 1948. This first conference was a most successful experiment and demands for a similar conference in 1950 indicated an appreciation by the girls of the opportunity to exchange ideas and a concern for the progress of the federation.

The programme for the first two days of the conference was designed to give training in club procedure, to indicate the scope of club activities, and possible service aims of clubs; on the last two days the annual general meeting was held.

## Ideal Setting

Diamond Harbour, on the other side of Lyttelton Harbour from the port, was an ideal setting. Surrounded by tall trees, Godley House sits snugly on the brow of a promontory with Diamond Harbour on one side and the Purau Arm to seaward. The mansion, now over 70 years old, housed the conference and most of the members. Fine weather enabled good use to be made of the wide verandas and lawns.

Mrs. B. Jarman, Dominion president, opened the conference at which the Federation of New Zealand Women's Institutes was represented by Mrs. W. Deans, and the Women's Division of Federated Farmers by a Dominion vice president, Mrs. M. Coop, of Banks Peninsula. Three field officers in rural sociology of the Department of Agriculture also attended.

Mrs. Deans, in the opening talk, described the role of the individual member, stressing the necessity for individuals to support their club officials. Unless ordinary members gave wholehearted support to their elected officers, they could not expect their clubs to flourish. Point was made of the wide range of activities open to clubs. The value of the roll call for practice in public speaking was stressed. Mrs. Deans appealed to the girls to remember that it was their movement and that it was the individual who would make it a success.

In his address "How Country Girls Can Teach Themselves" Mr. G. W. Southgate indicated where clubs could obtain ideas for new subjects for study and discussion and mentioned facilities such as discussion topics and tutors available from the four Councils for Adult Education. Lists of plays for those interested in drama could be provided. He referred to summer schools of one and two weeks that were run as holidays and where a variety of special courses was provided. The Correspondence School provided a range of courses that anyone of any age could take up. The facilities available from the Country Library Service were mentioned as well as those of the Physical Welfare and Recreation Branch of the Internal Affairs Department. Mr. Southgate indicated the pleasure that could be found in drawing on local resources for the history of one's own district.

Mr. B. J. Dunne, who supported Mr. Southgate on the same theme, spoke on the origin of drama and the value of amateur play production and drama groups in the development of a team spirit. He illustrated the greater benefit to be gained by forming a group of people with the same interest. If a Country Girl had a hobby, she might find others who were interested and all would benefit by learning and practising together.

## Meeting Procedure

Mr. G. Manning, in his address on "Meetings and Chairmanship," said that in a democratic society everyone should know how a meeting might be conducted so that a subject could be thoroughly and expeditiously discussed with everyone having the right and opportunity to express his or her opinion. It was as important for the member of a meeting to know the accepted rules of procedure as it was for the chairman. Mr. Manning worked through the agenda paper of a meeting and discussed the framing, the moving, the seconding, the amending, and the putting of a motion.

Three brief addresses on "Aims and Activities of Country Girls' Clubs" were given by Miss K. Scotter, Mrs. W. Fletcher, and Miss E. E. Unwin. Miss Scotter stressed the enjoyment of club life and illustrated her talk with her experience in Y.W.C.A. work among girls on the New South Wales coalfields and of the important contribution girls' clubs made to the life of the girls there at a time of unemployment. Miss Unwin said that where Country Girls' Clubs were close together inter-club events should be held and other organisations such as Young Farmers' Clubs might be encouraged to participate. Field days and visits to factories and farms were useful as additions to the talks and a variation from the usual club meeting. Mrs. Fletcher stressed the aims of the clubs to make country life more attractive and suggested that, since Country Girls were mostly farm girls, some emphasis should be given to farming activities in their club programmes.

Members listening to an address at the first annual conference of Country Girls' Clubs. [*Green and Hahn Ltd. photo.*

### Discussion of Specimen Remits

These informal talks led to a discussion by the girls of specimen remits. Within each of four groups different chairmen and secretary-reporters were elected to conduct discussion on each remit in turn. All the groups approved, amended, rejected, or provided a substitute for each remit according to the rules of good meeting procedure. When the groups had completed their deliberations the secretary-reporters presented the findings of each group.

The first remit, "That there is no need for Country Girls' Clubs," was rejected outright, some of the reasons being a desire for instruction; the need to counteract the drift to the towns; that girls should have equal opportunity with women, men, and boys, who have their own special organisations; that all girls could join in, whereas this was not so in a sports club; and that girls could plan their own entertainments.

On the next remit, "That a year's programme should be planned to develop more than one topic," opinion generally favoured a varied programme. A series of meetings on one topic was disapproved of because not everyone had the same interests, meetings would lose their attraction, difficulties would arise in small clubs, and because new members would be at a loss through missing the first part of the series. A wide range of topics was supported because each person had a better chance to express herself and it broadened members' outlook.

"That it is unsuitable for club members to take part in stock-judging and other farming competitions" was also rejected outright, but two groups gave special attention to stock judging. the feeling being that though girls did not know anything of it, they should have the chance to learn and participation would broaden their outlook.

The last remit, "That a club should centre its activity in its own concerns and interests," was opposed on the grounds that interests should be broadened and that clubs should be of service to their districts in such activities as raising funds for social services.

Business of the first annual general meeting included consideration and adoption of a constitution, finances, and recommendations to clubs.

### Recreational Activities

Recreation during the conference included games of volley ball, deck tennis, and bowls under the guidance of physical welfare officers. There were sight-seeing round the harbour both on foot and by launch and a bus trip from Diamond Harbour over the Summit Road from Banks Peninsula to Christchurch.

Documentary films were shown and the Summer Youth Group presented the play "The Burglar Alarm" in the hall of Godley House. The producer, Mrs. S. A. La Roche, spoke on plays and the Summer Youth Group. At the social evening, to which the local branch of the W.D.F.F. was invited, items were given from each club, and Mrs. E. F. H. Paine, of Diamond Harbour, spoke on the history of Diamond Harbour and the origin of Godley House.

◆

## "Tribute to Achievement": Pacific Film Unit

THE rather meaningless title, "Tribute to Achievement," carried by the copy of the 20-minute-long documentary of the New Zealand meat industry previewed recently was about the only thing to cavil at in what was otherwise a most entertaining and instructive film. It is to be hoped that before it is released on its circuit of all towns in New Zealand, arrangements for which have been completed, it will be given a new title that will convey to prospective theatre patrons, particularly farmers, something of what the film is about.

ROGER MIRAMS, of the Pacific Film Unit, has produced in "Tribute to Achievement" a film which all farmers should see. Films have been used fairly extensively in New Zealand in campaigns for increased production both during the war and afterwards, and because of shortage of film stock and other technical difficulties there has been far too little local production offered. Many of the overseas productions used have been of little real value from the point of view of stimulating production, and some of them have left much to be desired as entertainment. W. and R. Fletcher Ltd., for whom "Tribute to Achievement" was produced, are to be congratulated on having sponsored a film that should leave audiences who see it with a feeling of pride in this local cinematograph production and in the production of the country's pastures.

It is nearly 70 years ago that the first shipment of frozen meat was sent to Great Britain from New Zealand. In 1948 New Zealand provided more meat for Britain than any other country in the world. That is the theme of the film in which a tribute is paid to those who have helped to build the meat industry, which has become this country's greatest enterprise.

Excellent photography has reproduced in the early sequences of early morning mustering of sheep some scenes of such great beauty that one regrets the absence of colour. It is only a fleeting regret, however, as one is eventually left with the feeling that there is more authenticity in the pastel effects of black and white in the pastoral sequences.

The mustering of sheep and cattle, drafting, droving to the saleyards, the moving of store sheep from the hills to fatten on the low country, the operations of buyers from the freezing works, and the co-operation of the transport industry in the movement of stock are authentically reproduced.

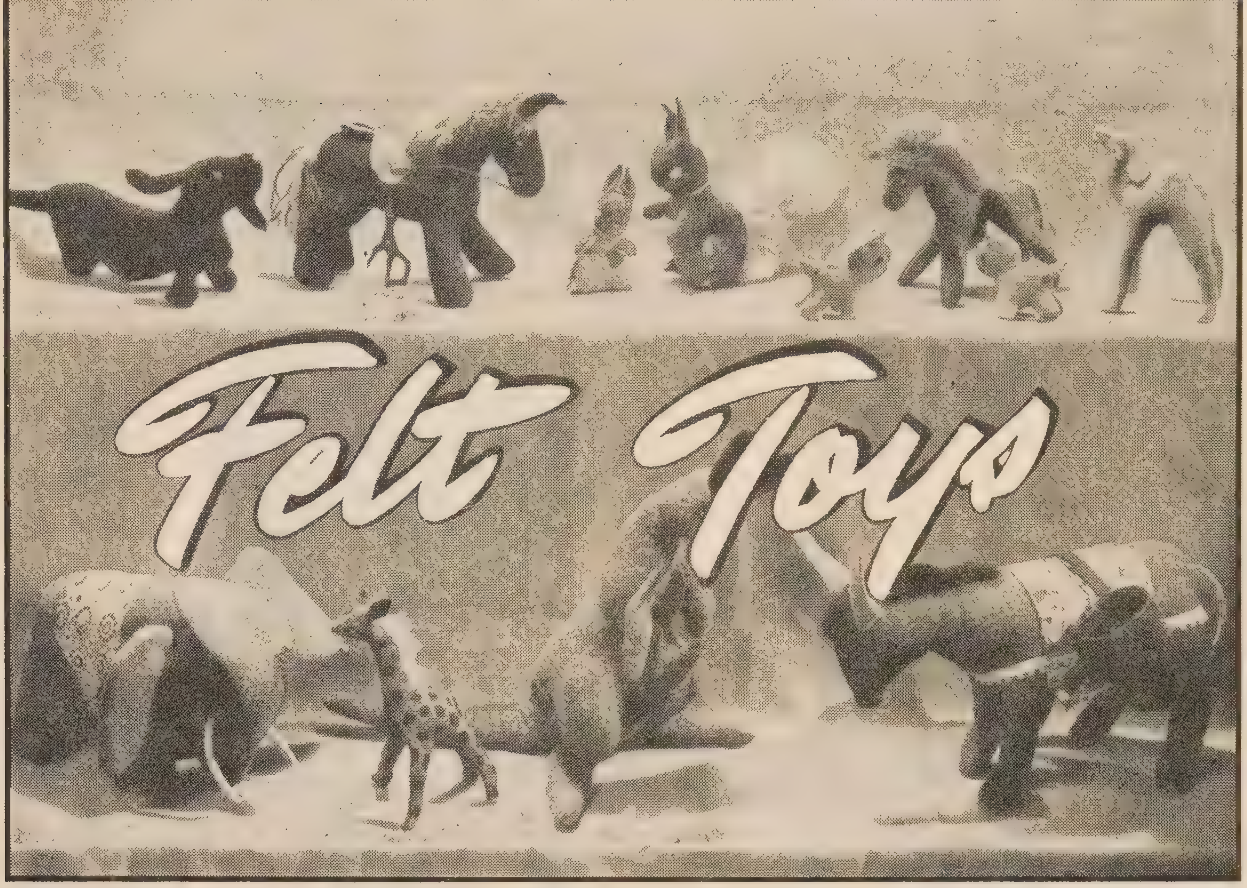
Every activity of a huge freezing works processing meat for export and treating and preparing all the by-products is picked out by the camera, and the tremendous organisation required to process 1200 pigs, 1000 cattle, and 8000 to 10,000 sheep per day in one works at the peak of the season makes a surprisingly entertaining and very instructive theme.

The last sequence of a refrigerated ship loading meat for Britain rounds off aptly a film that is a very faithful record from the farm to the consumer in Great Britain of the achievements of New Zealand's meat industry.

"Tribute to Achievement" was recorded by Fox Movietone, Sydney, and the shooting script was by Alun Falconer. Rex Walden's commentary is capable and convincingly knowledgeable of a generally technical theme. The sponsors of the film have generously arranged for 16mm. copies of the original to be made for the National Film Library and other distributive agencies through which they will be available to educational and other organisations desiring to show them.—*G.J.N.*

**"Tribute to Achievement": Pacific Film Unit; 20 min.; black and white with sound.**

Shooting a scene in the film "Tribute to Achievement."



# Felt Toys

**COLOURFUL "cuddly" animals, realistic or decorative, small or large, are quickly and easily made and are a universal favourite with children and almost equally popular with adults. Felt from old hats or new art felt is a fabric from which almost any soft toy can be made cheaply. This article by Eirene E. Unwin, Rural Sociologist, Department of Agriculture, Dunedin, deals mostly with the making of felt animals, but other materials can be used successfully for most of them. Patterns for a number of toys are given, but for people who would rather use original designs directions for drawing them are included.**

EVEN the person without artistic pretensions should not be afraid of attempting to draw her own patterns. A great deal of enjoyment can be had from it and some delightful and original results produced, and the satisfaction and pride of achievement are justifiably much greater from creating a new animal than from copying one from someone else. However, anyone but an experienced toy maker would be well advised to make up some of the tested patterns given before attempting to draw her own. That is the only way to be sure of producing not only a good drawing but a drawing of a good toy, for not all animal drawings will make up into good toys. Only experience in the craft of toy making and a careful study of the make-up of tested patterns will bring ability to judge a drawing and to know whether it will make a good toy. Similarly, only careful observation of real animals or good illustrations of them can teach whether a drawing for a toy will make up into a good animal.

Unfortunately, too many of the commercial soft-toy patterns on the market make up into extremely poor and unattractive animals. Animal toys, or indeed any toys for children, should not be grotesque or ugly. Distorted they may be if the distortion is pleasant and there is some reason for it. Colours and decoration may be quite unrealistic but still be pleasant to look at and attractive to children. Human-looking eyes and smiling mouths can add a great deal to the appearance of a toy, though the animal on which it is based may have a very unsmiling expression in real life.

If a round, cuddly toy is wanted for little children, the choice should be a round, cuddly creature like a duck or chicken or sitting rabbit. No attempt should be made to make a dog cuddly by shortening its legs to mere buttons and turning its head into a shapeless ball with eyes. Older children appreciate more complicated animals, such as elephants, bears, dogs, and horses, with longer legs and other realistic details. Only adults appreciate complete caricatures of animals suitable as mascots, and even these need not be ugly.

## Materials

Felt is probably the best and cheapest all-purpose material for soft toys. Discarded felt hats may be steamed over the spout of a boiling kettle, stretched, and pressed reasonably flat. Art felt may be bought by the yard or in small squares at any large draper's shop and usually provides a better choice of colours than hat felt.

Woven materials may be used instead of felt, and the rag-bag may contain something suitable. They must be strong and closely woven, as there is considerable strain on them at the seams and the stuffing must not be able to be seen through them or to leak out. Velveteen, woollen coating and suiting, firm dress fabrics, gingham, other strong cottons, plain or fairly plain furnishing fabrics, and strong fur fabrics are all suitable. Thick towelling is quite good, but gets dirty very quickly with use.

Heading photograph by Campbell Photography.

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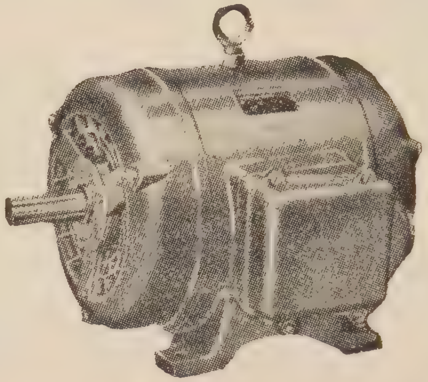

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Suede, kid, or chamois leather may be used for paws and other details. American cloth can be used for washable toys, but it is not so cuddly as an ordinary woven material.

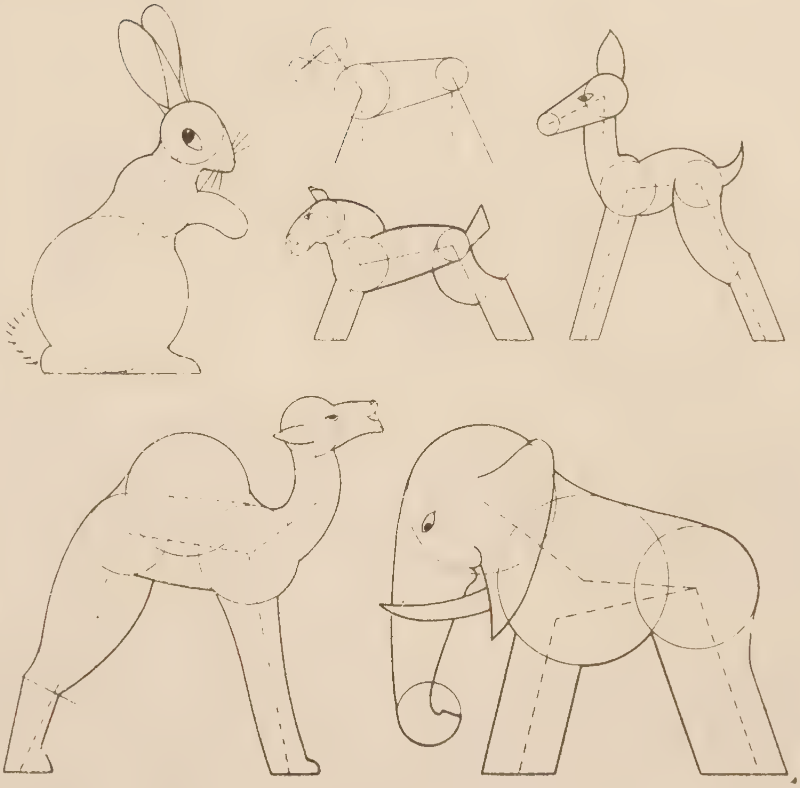
Cured lambskins or sheepskins with the wool on them make delightful woolly animals, but they are harder to work and this is really a craft on its own, though for anyone who has cured skins and knows how to handle them the toy-making directions given would be useful. Fur also needs special treatment, but the results can be very good if it is handled properly.

## Stuffing

Clean teased sheep's wool is probably the best all-purpose stuffing; it is light and springy and easy to obtain in most country districts. For people not so fortunate as to have wool available grey flock is probably the next best; it is obtainable cheaply from an upholsterer. Kapok is excellent for small animals, though difficult to get new at present. Old woollen garments cut up very small, scraps and ends of knitting wool, or wool waste from the mills are fairly good substitutes for raw fleece wool.

Other stuffing materials, in order of preference, are: Fine wood-straw or shavings (springy, light, and washable; it should be rolled into small balls for use); wood shavings from a carpenter's shop (suitable only for really large toys); white cotton wadding (better than grey flock for light-coloured toys covered with loosely-woven material); and cotton waste from factories.

If a white or light-coloured felt has been used and the stuffing is dark or messy, the opening should have a piece of white cloth tacked round to prevent the outside of the animal from being discoloured while the stuffing is being inserted. This covering should be retained until just before the opening is sewn up.

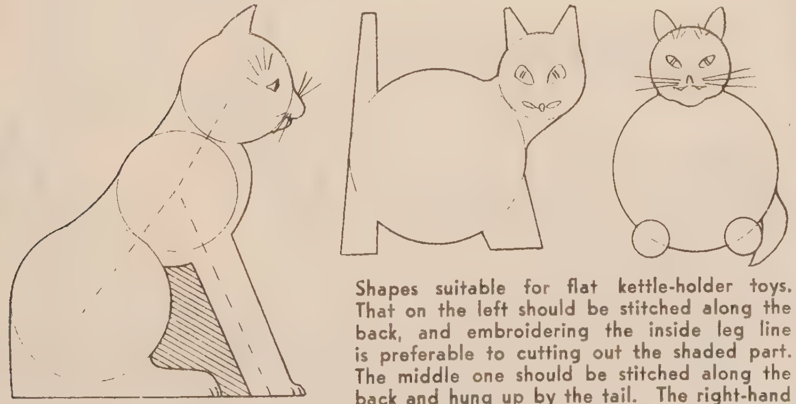

Simple animal shapes for flat toys, based on straight lines and circles.

## Flat Toys

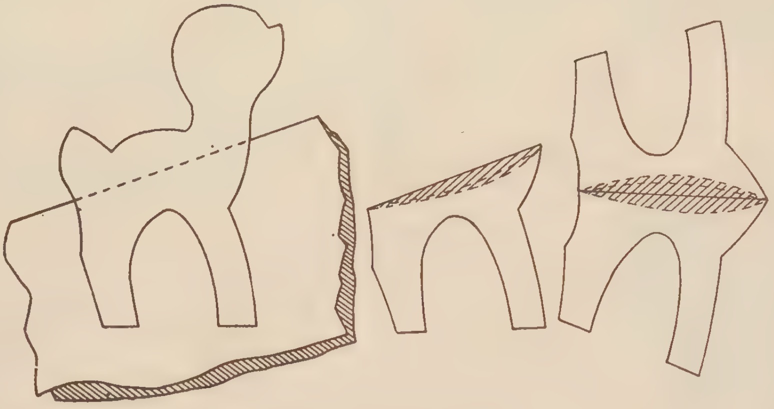
Very simply made from quite small pieces of felt, flat toys may be trimmed with gingham or other bright cotton materials. A child can make them just as a toy; an adult can turn them into a kettle holder or needle book. Very simple animal shapes should be used and are not difficult to make up, being based on circles and straight lines.

Before drawing a new animal, study a realistic drawing or a photograph and try to reduce it to these two basic geometric forms. Once the right proportions and relationships have been obtained and drawn with compass and ruler the rest of the details to make up a simplified form of the whole animal come easily. For all animals illustrated except the elephant and giraffe the centre of the chest circle is lower than that of the hind quarters circle. The simplest order for drawing is: Chest circle; back line up to hindquarters circle; line for angle of neck; head circles; leg lines; filling out and expression lines. An advantage of these "circle animals" is that their shapes are easily stuffed and look well in material. Too many details and awkward corners are avoided.

To make a flat toy cut two pieces, a back and a front, and oversew, machine, or running stitch them together along the animal's back. Embroider a face and possibly details of the paws. To make them slightly padded (as for a kettle holder) cut four thicknesses, sew them together in two pairs, and stuff them a little before sewing all four together along the back. The two parts of a standing-up tail may be left separate except at the tip to form a loop for hanging up.


Shapes suitable for flat kettle-holder toys. That on the left should be stitched along the back, and embroidering the inside leg line is preferable to cutting out the shaded part. The middle one should be stitched along the back and hung up by the tail. The right-hand one should be stitched down its right side.

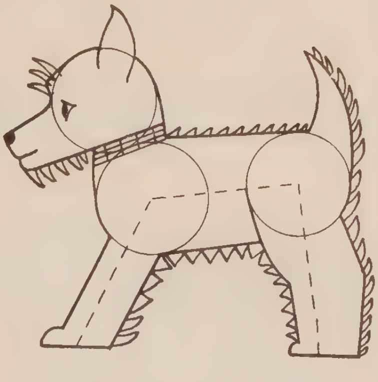
# MAKING FELT TOYS



For making an underbody a completed side view should be used—that is, one which has been thickened to allow for roundness when stuffed. Left—Draw a line from tail to breast, lay the pattern on a folded piece of paper with the fold to the line, and draw round the lower half of the body. Middle—A half underbody, showing where the top is hollowed out if necessary. If this shape is used, two pieces are required. Right—A whole underbody with a straight centre line or, if the top has to be hollowed out, a long dart. Only one piece of this shape is needed.

## Strip-type Solid Toys

The same or similar patterns may be used for the strip type of solid toys if the animals have short legs, thickness being given by joining the two halves together with a strip at least 1½in. wide running right round them. To calculate the length of the strip, measure carefully round the side-view pattern with a tape measure and add ½in. for joining. The strip should be joined under the animal where the stitches will show least. Tack the two sides to the strip so that they match exactly; if the strip stretches unevenly or the sides do not match, the animal will be crooked and will not stand up properly. Using matching or contrasting thread, sew the seams firmly with stab stitch, oversewing, or blanket stitch. The seams are on the right side, and the two ends of the strip are joined last of all.



An extra-large seam allowance can be fringed after the animal has been sewn up to give the effect of a shaggy dog.

When a short length of seam remains to be sewn stuff the toy. Push the stuffing well into the furthest corners first and do the body last. Finally, complete the seams and join the ends of the strip. Embroider or appliqué a face, and add ears and any other simple trimmings desired. If the animals have ears that stand up, these should be sewn in with the strip. A red tongue improves a dog, especially if his mouth is slightly open. However, do not put on too many trimmings, as the very simple shapes do not warrant it.

If the strip is sewn in a little from the edge of the side pieces, the extra seam allowance can be snipped to form a fringe—for example, down the backs of the legs and along the tail of a shaggy dog, or for a horse's mane. Shaggy ears can also be effective on a spaniel, but stand-up ears are best for most animals.

Strip-type toys are best 4 to 6in. long (with a 1½in. strip) and should not be longer than 12in. (with a 4in. strip). They are so simple that if they are made too big they become uninteresting.

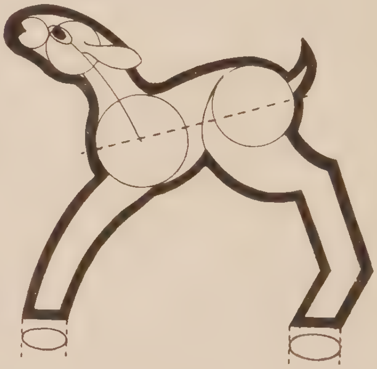
## Four-legged Gusset Toys

Though they represent the most advanced stage of soft-toy animal patterns most four-legged gusset toys are not really difficult to make. Several of those illustrated were drawn by a mother from pictures in her children's story books. A side and a front view are needed. Animals with long, slender legs may be made up in this way, but the legs of even the smallest animals should not be narrower than ½in. or they cannot be stuffed, so the slender effect should be obtained by making the legs longer, not narrower.

When the desired side view has been drawn, add a uniform increase all round to allow for the rounded shape of the body when it is stuffed—¼in. for animals up to 6in. long, ½in. for those 6 to 15in. long, and for bigger ones still about ¾in. Then cut the increased side view in duplicate.

Next draw the underbody. Fold a piece of paper and lay a side piece on it so that a line from the tail to the breastbone lies on the fold. Draw the outline of the lower part of the body on the paper and cut it out, still folded. Open it out, and if it seems too wide compared with the width of the side piece, refold it and hollow the line along the fold. The underbody may be cut out in one piece or two, but if the fold line has been curved, a long dart must be machined into a one-piece underbody to give this curve, so it is just as simple and more economical of felt to make it in two. The centre seam helps a little to pull in the legs of the animal, though sometimes a seam up the centre of the chest is undesirable. For smaller animals with long legs, the front and back legs of the underbody may be separated also if it is necessary to economise with felt; this necessitates a short cross-seam under the animal, but it can be inconspicuous. Camel and giraffe patterns are made like this.

Finally draw the head gusset. First measure the required length along the head of the side piece from just at the back of the head, over the forehead, and round the nose to just under the chin. Mark off this length along the fold of a piece of paper wide enough to make the gusset. Mark off also the points of the profile where the width of the gusset will change —for example, the top of the head, the forehead, the eye, and the tip of the nose. To measure the width at these points correctly it is necessary to have or to draw a front view of the animal. The effect can be improved surprisingly if the varying widths of the face gusset are in proportion and true to life. Half the width is marked on the folded paper at each point. Lines the



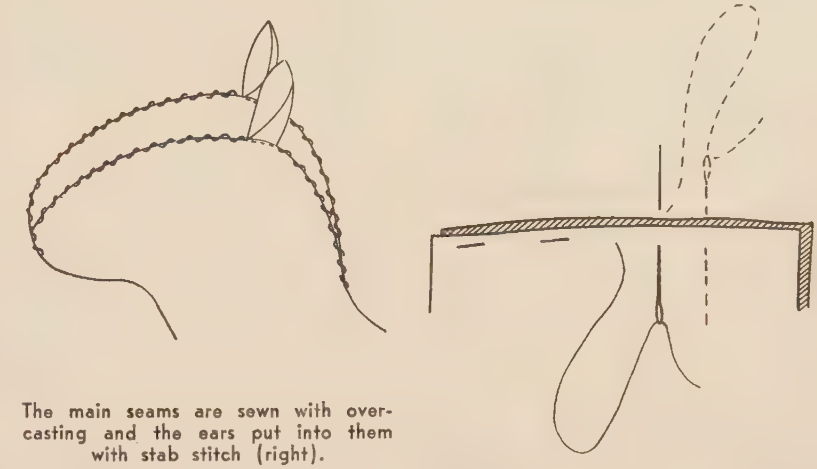
A side view thickened to allow for roundness when the animal is stuffed. The line from tail to breast is that of the underbody. The soles of the feet are drawn the same size as the bases of the legs.

correct length can be drawn at right angles to the fold to make this easier, and then the ends of the lines joined up to form the outline of half the gusset, which is cut out of the still-folded paper so that both sides are alike. The points may be rounded off and any necessary adjustments made. The pattern of the gusset is better cut a little too wide than too narrow, as it is easy to snip any extra off the felt when making up.

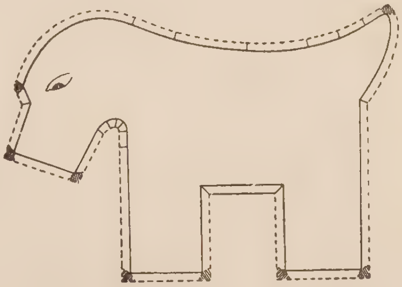
Ears, tail, and the soles of the feet are cut separately. Only large animals or small animals with large feet need separate soles. Great care should be taken to have the ears a realistic shape and in the right position. A horse can be changed to a donkey by altering its ears and tail and omitting the mane. The toy maker who expects to make her own patterns at any time should collect good illustrations of animals, especially front and side views, as it is surprisingly difficult to remember what a dog's ears or what a cat's eyes are like at the moment when they are to be made.

**The ears, eyes, and outline can make all the difference between a well-designed and a badly designed toy.**

When the pattern pieces have been completed they are best mounted on light cardboard, labelled carefully, and marked with any guiding lines such as positions of eyes and ears. Also mark on each the numbers of pieces of felt to be cut from it, which are normally two side pieces, one underbody (or two half underbodies), two ears, one head gusset, and sometimes one tail and four soles of feet. Some of the patterns given do not conform to this plan, but they are clearly marked. It is a good idea to mark on the side piece the total number of pattern pieces for the whole animal and to label each piece with the name of the animal, as this helps ensure that the pattern is complete and correct every time it is used. All the pieces for each animal should be kept together in one clearly-labelled envelope.



The main seams are sewn with overcasting and the ears put into them with stab stitch (right).



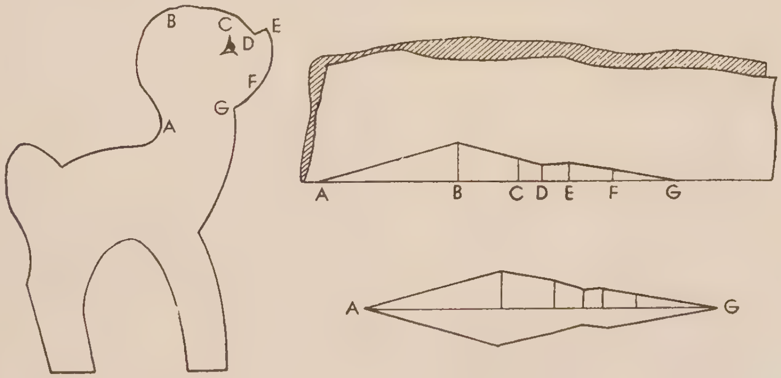
A pattern with seam allowance for sewing up on the wrong side. The allowance should be clipped as shown on all inward curves and corners. If the shaded parts are cut off, the outward corners will turn right side out more readily.

## Stitches

Nearly all the seams in a felt toy can be made to lie flat, and for this fine oversewing is the best stitch. Hold the two pieces of felt wrong sides together and make the stitches about 1/10in. apart and about 1/10in. from the edge. Matching or contrasting embroidery thread or buttonhole twist may be used, depending on whether the seam is to be inconspicuous or emphasised. Shiny silks which fray easily should not be used, and preferably neither should stranded cottons. Use a thicker thread for the bigger toys.

If the animal has been made in a bright, decorative colour, the stitching may be decorative too, and for this blanket stitch in a contrasting bright colour is suitable. As it uses up more seam allowance, it makes the legs of the animals smaller and more difficult to stuff, so it should not be used indiscriminately. If blanket stitch is planned, a good $\frac{1}{8}$in. seam allowance may be left when cutting out. A really big animal should have a wider seam allowance for blanket stitch, but it is doubtful whether the ridgy seam is as satisfactory as the flat, overcast one.

Felt may be machined on the wrong side if a $\frac{1}{8}$in. seam allowance has been left when cutting out. The outline for the machining should be carefully drawn on to the material, as it is most important that the line of machining be exact or a poorly shaped animal will result. A fairly fine stitch should be used and each seam fitted carefully and pinned beforehand. However, it is much more difficult to sew intricate shapes well on a machine, and small animals in particular are better hand sewn on the right side. The seam allowance of a machined toy should be clipped with the points of sharp scissors at all the inward



Making the head gusset. Left—The points where the width of the gusset will be changed are lettered on the side view. Upper right—These marks are transferred to the fold of a piece of paper the correct distance apart. Perpendicular lines half the width of the gusset are drawn from them and their ends joined. The gusset is then cut out of the folded paper. Lower right—A finished gusset, the points of which may be rounded.

corners almost up to the line of machining, and inward curves should be snipped in several places. If this is not done, the shape will be spoiled when the animal is turned inside out.

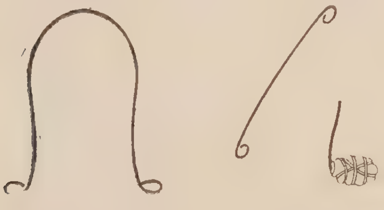
A space should be left in the seam for stuffing the animal, preferably underneath, where the stitches sewing it up will not show, or along the back, especially if the animal is to have a saddle or cover over its back when it is complete.

The ear of a small animal is usually sewn in with the seam between the head gusset and the side of the head. For this short distance the seam is sewn with stab stitch. Ears usually look best if folded double at the base, with the fold backward.

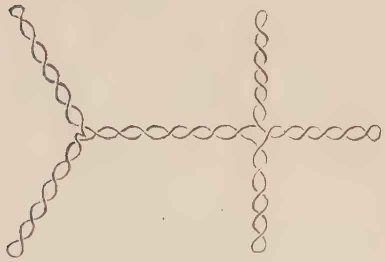
## Wiring and Stuffing

Small animals with short legs need no wiring, but an animal with long legs, whether they be thin like a giraffe's or thick like an elephant's, must have wire or papier mache supports, or with use the legs will soften and bend. Wire is best for the slim-legged animals, and papier mache cylinders for thick ones.

Fine hat wire may be used, doubled and twisted—one piece for all four legs, and perhaps for head and tail too—or thicker wire (No. 20 galvanised) when two separate pieces are necessary, each bent into a hoop. Single fine wire is sufficient for quite small animals. If the legs are to be made so that children may bend them (to make the animal sit down, for instant), electric flex is excellent as the support. It should be the fairly thick one-cord type, which can be bent easily but will hold its shape well however it is arranged. It is also good for long tails.



Bending and padding the wire supports. Above—Leg and tail supports made of single fairly thick wire and the padding of the loops at the ends. Below—A support for all four legs and head made from thin twisted wire. Another section for a tail support could be added if necessary. The ends should be twisted well into the centre piece.

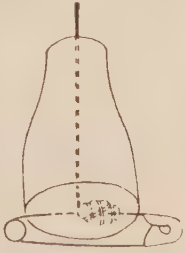


The correct way to bend the wires is illustrated in the preceding columns. In each case the loop at the end should be padded with a small piece of stuffing tied in place with cotton. The wires should be long enough to go well up into the body of the animal so that stuffing may be put in all round them.

Papier mache cylinders for elephants' legs are made as follows: Take a rectangular piece of strong paper, paste it well all over, and roll it round a thick knitting needle until the cylinder is thick enough to be firm. Slip out the needle (this is easier if it has been lightly greased beforehand) and leave the cylinder in a warm place to dry. Cut off pieces long enough to reach from the sole of the foot well up into the body, using a razor blade rather than scissors, as these would squash the roll. Before use stuff the middle of the cylinder firmly.

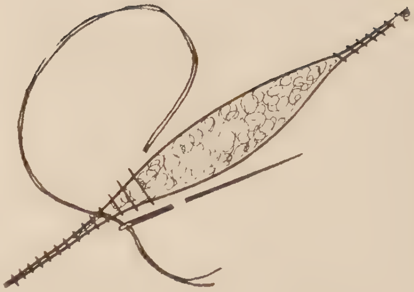
To avoid unnecessary mess when stuffing a toy lay a cotton cloth or newspaper over the table and sit close to it. Pull the stuffing into pieces the size of a marble and push each firmly into place before adding the next. Begin with the parts furthest from the opening, and if leg supports are being used, stuff the head and neck before the legs. To get the stuffing well into corners push it down with a stuffing stick; a blunt-pointed wooden meat skewer or pencil, a paste brush handle, and a strong, fairly thick knitting needle will make three good stuffing sticks of different sizes. Each narrow part must be filled completely before moving on, because it is not possible to force more in later without straining the seams. To form a well-shaped forehead keep one finger or thumb flat across the face, usually just below the eyes, while stuffing; especially with dogs this helps to give the typical profile. In all cases it is better to hold the casing in the hand while stuffing it, for holding it on the table tends to produce a flattened, shapeless toy. Remember the shape of the animal, and if necessary have a picture to follow, for much of the good shape of the limbs depends on careful moulding during stuffing.

If the wire support goes into the head and tail, it must be put in before stuffing is begun and the padding pushed in all round it. To keep it in position in the legs use four strong safety pins, passing one through the sole of each foot and into the padded loop at the end of the wire support from the outside. Stuff carefully all round the wire right up each leg. Do not remove the pins until the wire is completely covered with stuffing.



To hold the wire support in place while a leg is stuffed, a safety pin is passed through the sole of the foot and the padded end of the support.

Papier mache cylinders cannot be held in this way, and each must be held down carefully by hand, pressed right against the sole of the animal's foot and retained in the middle of the leg, while the stuffing is being put round it. At the tops of the legs put plenty of stuffing on the outsides, or when the toy is handled the stuffing tends to wear loose and flabby so that the legs become wobbly. Stuff the back legs after the forelegs, and finally the body. If the animal has a tail, this should be stuffed before the legs; a kangaroo's tail should have a wire support.



Ladder stitch, which is used for sewing up the opening when a toy has been stuffed unless overcasting is suitable. Very strong double thread should be used for the final sewing up and all stitches pulled tight.

**Do not stuff the toy so much that it is hard, but let it be gently firm when pressed, without loose places. Too hard a toy is not cuddly; too soft a one rapidly loses its shape with use and becomes uninteresting.**

When stuffing is completed, hold the toy between the knees, opening uppermost, and begin sewing it up in ladder stitch, or with oversewing if this was used for the rest of the seams. Use a long, strong darning needle and very strong matching cotton, double or even in four thicknesses. After the first stitch or two pull the thread very tight. As the sewing advances push in small extra pieces or stuffing so that the animal is quite firm at the seam yet the worker is not troubled with pieces of the stuffing working out and getting in the way while she sews. Finish off with two or three firm blanket or buttonhole stitches, run the needle through the animal somewhere, pull the thread tight, and cut it off close. The end will disappear back into the toy if the thread has been pulled sufficiently tight.

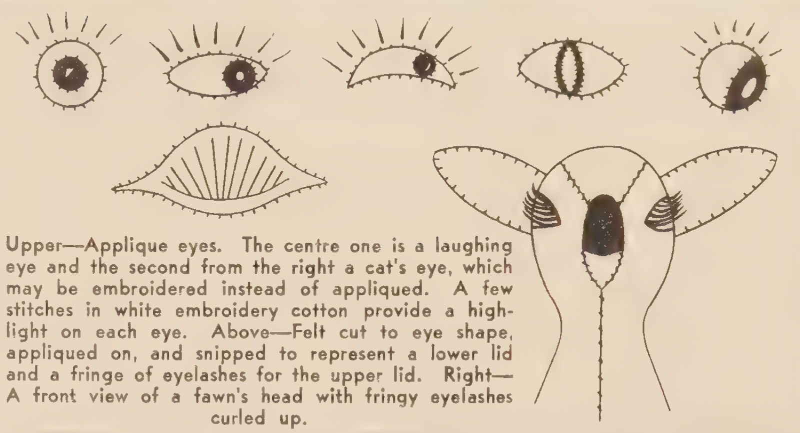
## Finishing

When the animal has been stuffed and sewn up it is by no means finished, though the biggest part of the work has been completed. Carefully-done finishing details make all the difference between an attractive, satisfactory toy and one that is unrealistic or ugly.

### Legs

First, the legs must be braced and drawn in close to the body if the animal is to stand on them, so that even with use the legs will remain firm and will not sag outward. There are two ways of bracing the legs, the first being better for felt and the second for cloth animals. For either, strong thread and a long, strong needle are necessary; a curved upholsterer's needle may be an advantage for big animals.

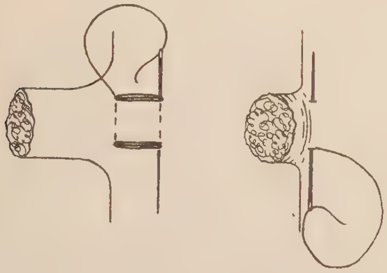
# FINISHING DETAILS OF FELT TOYS



Upper—Applique eyes. The centre one is a laughing eye and the second from the right a cat's eye, which may be embroidered instead of appliqued. A few stitches in white embroidery cotton provide a highlight on each eye. Above—Felt cut to eye shape, appliqued on, and snipped to represent a lower lid and a fringe of eyelashes for the upper lid. Right—A front view of a fawn's head with fringy eyelashes curled up.

**For felt toys:** Take a stitch through the underside of the body, a little way from where it joins the leg, and fasten the thread firmly. Put the needle into the leg opposite where it comes out from the body and take a long stitch through the underside of the leg. Pull the thread very tightly and take a long stitch through the underbody again. Repeat several times. Stitch through the leg one way, then one back the other way through the underbody, pulling the thread very tight all the time, so that the leg is held firm and close at right angles to the body. Repeat for the other three legs. On small animals it may be necessary only to sew from leg to leg rather than from underbody to leg. The baby camel, which has a very narrow underbody, was stitched like this.

**For cloth-covered animals:** Bend the leg in at right angles to the body, making a little crease on the inside where the two join. Slipstitch this fold into place, taking up as big a tuck as possible. If necessary, sew it twice, taking up a still deeper tuck the second time. All the stitches should be small and tight and the end finished off firmly. Repeat for the other three legs. Any other part of the animal may be braced in the same way—for example, to hold a head, tail, or wing firm.



Left—Bracing stitches from the inside of the leg to the underbody to help make the leg firm. Right—The stitches pulled tight, drawing the leg up at right angles to the underbody. Very strong or double thread should be used.

### Eyes

Glass eyes for toy animals cannot be bought readily now, and in any case embroidered or appliqued eyes are better on toys for small children, as they do not come off so easily and are less harmful if swallowed. For fur-fabric animals glass or button eyes look more realistic, but for felt and cloth animals felt applique eyes can be very satisfactory.

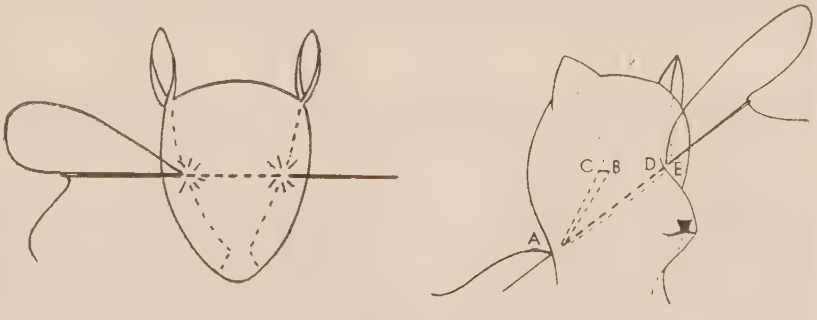
Cut a small circular or eye-shaped piece of felt in yellow, orange, or blue for the iris, and a small section in brown or black for the pupil. Sew the dark piece on top of the coloured piece and sew the whole eye in position with tiny overcasting stitches. A little spot of white made on the pupil with embroidery cotton gives a highlight and improves the look of the eye.

If long eyelashes are wanted for a deer, horse, or similar animal, cut an eye-shaped piece of dark felt and sew it round the edge into position. Then with sharp-pointed scissors cut along it ⅛in. from the lower edge for the lower lid. For the lashes snip the upper lid into a fringe, radiating the cuts carefully. If the eyes are large, it may be necessary to sew a small piece of coloured felt under the lashes for an eyeball, but the fringy lash usually is sufficiently suggestive by itself.

For quite small animals embroidered eyes are probably best. Satin stitch should be used, one colour for the iris and a dark colour or black on top for the pupil. Again a white spot in each pupil adds a highlight and gives the eyes a sparkle.

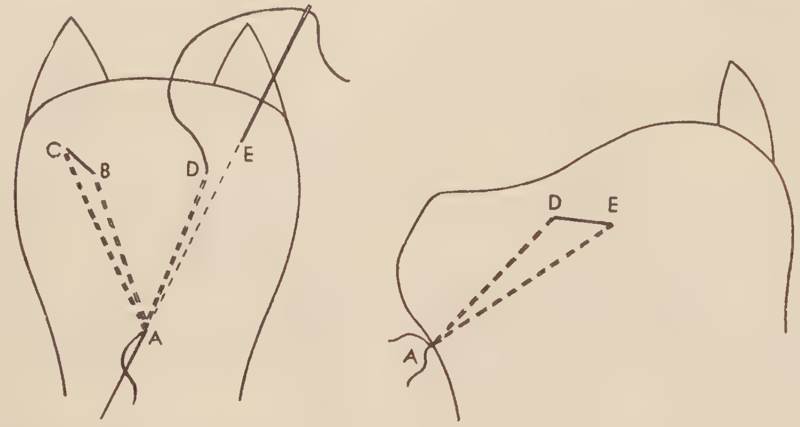
If the animal has both eyes on the front of its face, for example, a cat, monkey, bear, and some dogs, the two eyes should be made alike, not a right and a left, or it will appear to squint. If the eyes are placed on the sides of the head (as in a horse, deer, elephant, rabbit, and most dogs and birds), a right and a left eye may be made, both looking up, down, or forward.

Before the eyes are sewn into position hollows may be made in the animal's head by what is known as "needle modelling" to give a more realistic eye socket. Really thorough needle modelling is not easy, but for the more advanced toys it is worth while. First study the placing of the eyes carefully; an animal can be spoiled by having its eyes in the wrong place, and again pictures and sketches should be consulted to get this right. To model for eyes on the sides of the head several stitches are taken right through the head from one eye socket to the other, and by pulling these tight the desired hollows are formed. If the eyes are on the front of the face, the stitches should be taken right through from the eye socket to a point at the base of the back of the head; the hollow formed at the back of the head is not really wanted, but with care does not show much. The thread used should be strong, and several stitches should be taken and the thread pulled tight enough to make the hollows just right. On small animals with embroidered eyes sufficient hollow can often be made with the embroidery thread, especially on those with eyes on the sides of their heads.

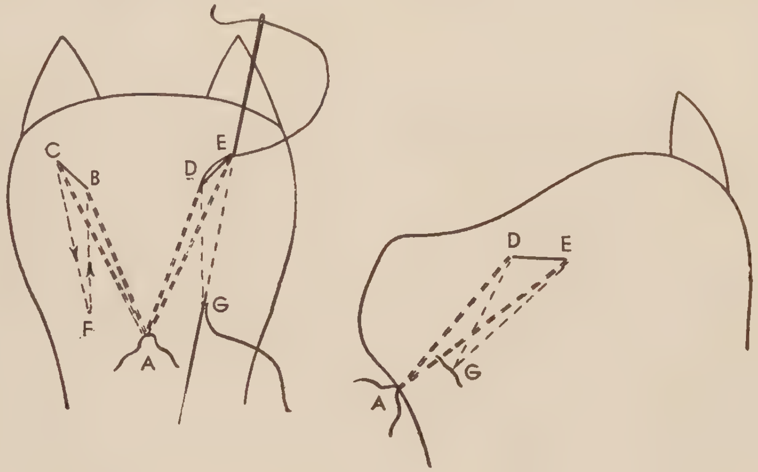


Needle modelling to make eye sockets before sewing on the eyes. Left—If the eyes are on the sides of the head, pass the needle several times from socket to socket, pull the thread tight, and knot the ends. The knot and stitches are covered later by the eyes. Right—For eyes that look forward, begin at A and pass the needle to B, leaving a fairly long end at A. Carry the thread to C along the length of the eye socket and pass the needle back to A. Make as small a stitch as will be firm on the outside, then pass the needle to D, along the eye socket to E, and back to A. Pull all the stitches firm, repeat if necessary to make the sewing very strong, and tie the ends at A with a reef knot. Cut the ends fairly close and cover them later with a collar or bow. If woollen cloth or other rough fabric has been used, the knot may not show or need covering.

### Needle Modelling to give a Cat Eye Sockets, a Smile, and a Nose

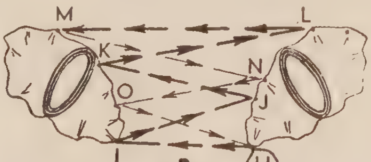


Stage 1—Pass the needle from A to B, on the surface from B to C, then back to A. Pull the ends tight and knot them at A. Repeat from A to D, to E, and back to A.

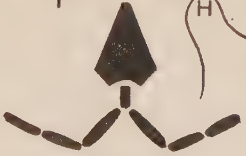


Stage 2—Pass the needle from F to B, on the surface from B to C, then back to F. Pull the ends tight and knot them at F. Repeat from G to D, to E, and back to G. The double dotted lines are the stitches of stage 1.

Stage 3—Sew on the eyes. To make it bulge, a felt eye may be cut a little too big, gathered along the lower edge, and stuffed from behind while being sewn on. The pupil should be embroidered on with coarse thread and a light high light put in the middle.



Stage 4—Modelling the nose. Start at H, leaving an end, thence to I, J, K, L, and M, always through the nose, and finally back to H via N and O. Make the smallest stitches possible on the surface. Pull the threads tight, tie the ends at H, and catch them beneath the eye. If necessary, begin modelling lower down the nose than H. With some modification this nose modelling can be used for other animals as well as cats.



Stage 5—To complete the face, applique on a brown velvet nose, embroider the mouth with large backstitches, couch a thick double thread round the eyeball to make lids and hide the gathered edge of the felt, and sew on whiskers.

**Mouths and Noses:** Sometimes the modelling can be extended to the mouth as well as to the eyes. The illustration shows how a smiling cat's face may be made with stitches from the mouth to the eyes and back again. A little practice with this sort of thing should enable the toy maker to create delightful expressions on her animals, but the toys should smile, if possible, and not look fierce or sad. Making the corners of the mouth turn up helps the smile. Even if the animal's mouth tends to droop like a rabbit's, the very tips should turn up or the effect will not please a child. Both sides of the mouth should be exactly alike or the expression will be sarcastic. Holding a face up to a mirror helps to check whether both sides have been made alike.

Mouths may be embroidered or appliqued. Shapes for several different animals are illustrated. A dog looks well with an open mouth and a lolling tongue; the mouth is drawn open, a shaped mouth gusset sewn in similarly to the head gusset, and a red tongue added.

**Ears**

Whatever material the toy may have been made of, felt is almost always suitable for ears, as it stands up well.

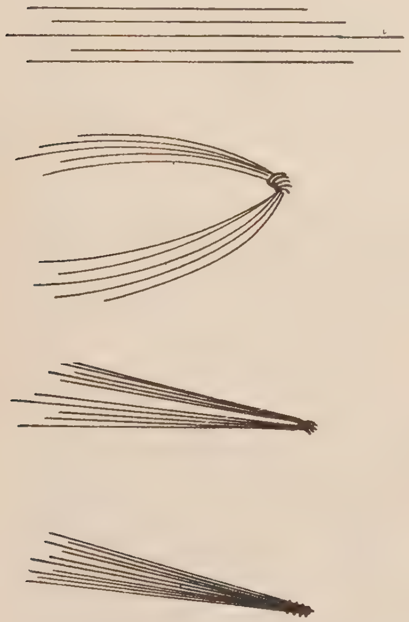
Several typical ears are shown. A horse's ear is folded edges to middle before being sewn in. Dogs usually have theirs folded in halves, double edges forward, and put in with the head gusset. Cats' ears are not put in the head gusset seam but are sewn directly to the head, or through a slit cut for them, along a curve. The worker's thumb may give the right curve if the ear is bent round it. Elephants' ears are sewn facing forward and then folded back and caught with a few invisible stitches.

If the ears are big and are to be very stiff, they should be cut double and perhaps even given a stiff interlining. Seam allowances will be necessary and the two or three thicknesses must be machined, right sides together, all round the outside edge except across the base. Then the seam allowances are clipped and the ear turned right side out before being sewn into place. A white rabbit may be given a pink lining to its ear in this way. Sometimes a felt front or back will give sufficient stiffening without an interlining.

For felt animals only, ears not put in with the head gusset seam may be pushed through shaped cuts in the sides of the head and stitched firmly on the inside before the head is sewn up. The worker must be very sure of the correct pattern line, as normally ears should not be put on until the animal has been stuffed or they may turn out to be in the wrong place. However, with small felt animals the stuffing usually does not alter the shape sufficiently for there to be any danger of the ears being wrong if they are put in before or while the head is being sewn up. Ears put through cuts in the head may be sloped forward or backward. An extra seam allowance is necessary on the base of the ear piece, and this is shown on some of the pattern pieces. Cloth-covered animals should not have cuts made for the ears or the edges of the cuts may fray.

**Whiskers**

Though they may be embroidered on, whiskers are more realistic if they are made to stick out. Bristles from a house-painter's brush are excellent—white ones if possible, but if not, black or brown. To fasten them firmly, select 3, 4, or 5 long ones, lay them unevenly together, fold the whole bunch in halves, and oversew them at the fold to one side of the face. Then bend the whiskers close against the toy, slant them upward to give a happy look, and oversew them again over the double fold. Repeat with more sets of whiskers on both sides of the face. A cat or lion should have the bases of the whiskers arranged in a definite pattern on either side of the face. If white whiskers are sewn with dark thread, an effective little dark dot is made at the base of each group.



Sewing on whiskers. Arrange up to five bristles unevenly. Fold them into a loop and oversew them. Bend them sharply and slightly upward close to the face. Oversew them again, this time over both parts of the fold.

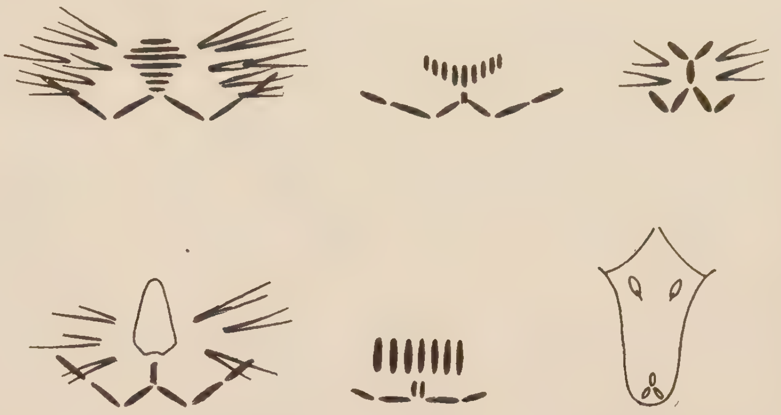
If paint brush bristles are unobtainable, a few stiff hairs from the tail of a horse or cow would do.

**Horns and Tusks**

For small children's toys horns supported with wire are not advisable, but the experienced toy maker making realistic animals for older children may want to experiment in this way. Such horns should be covered, and some circular-woven or knitted braids out of which the core can be pulled make excellent coverings for wire horns and antlers.

On toys for younger children rolled felt or kid makes very satisfactory horns and tusks. Cut the material as long as required but several times wider and tapering to a point at each end. Roll it up tightly and hem it along its length. Sew it to or through the head in the required position. Tusks are pointed at only one end.

## FACE DETAILS OF FELT TOYS



Embroidered noses and mouths. Upper—Cat, bear, and rabbit. Lower—Another cat (with applique velvet or felt nose), dog, and duck's beak.

**Tails**

Fringed at one end beforehand, rolled felt may also be used for a tail, but the imaginative toy maker will not be at a loss to invent tails. The squirrels in the photograph at the head of this article have tails of stiff, single-core electric flex, one covered with fur and the other with lambs' fleece, and these can be bent into any desired shape.

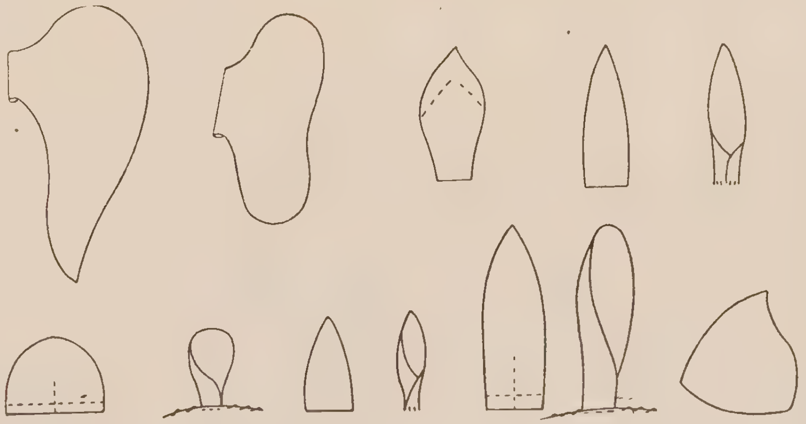
**All trimmings, and especially tails, should be sewn on very firmly into a seam, if possible, or through a cut made in the felt for them, as children usually pick their toys up by these "handles."**

To withstand such treatment, which is quite normal and must be expected, the toys and their trimmings must be made strong.

**Manes, Fringes, and other Finishing Touches**

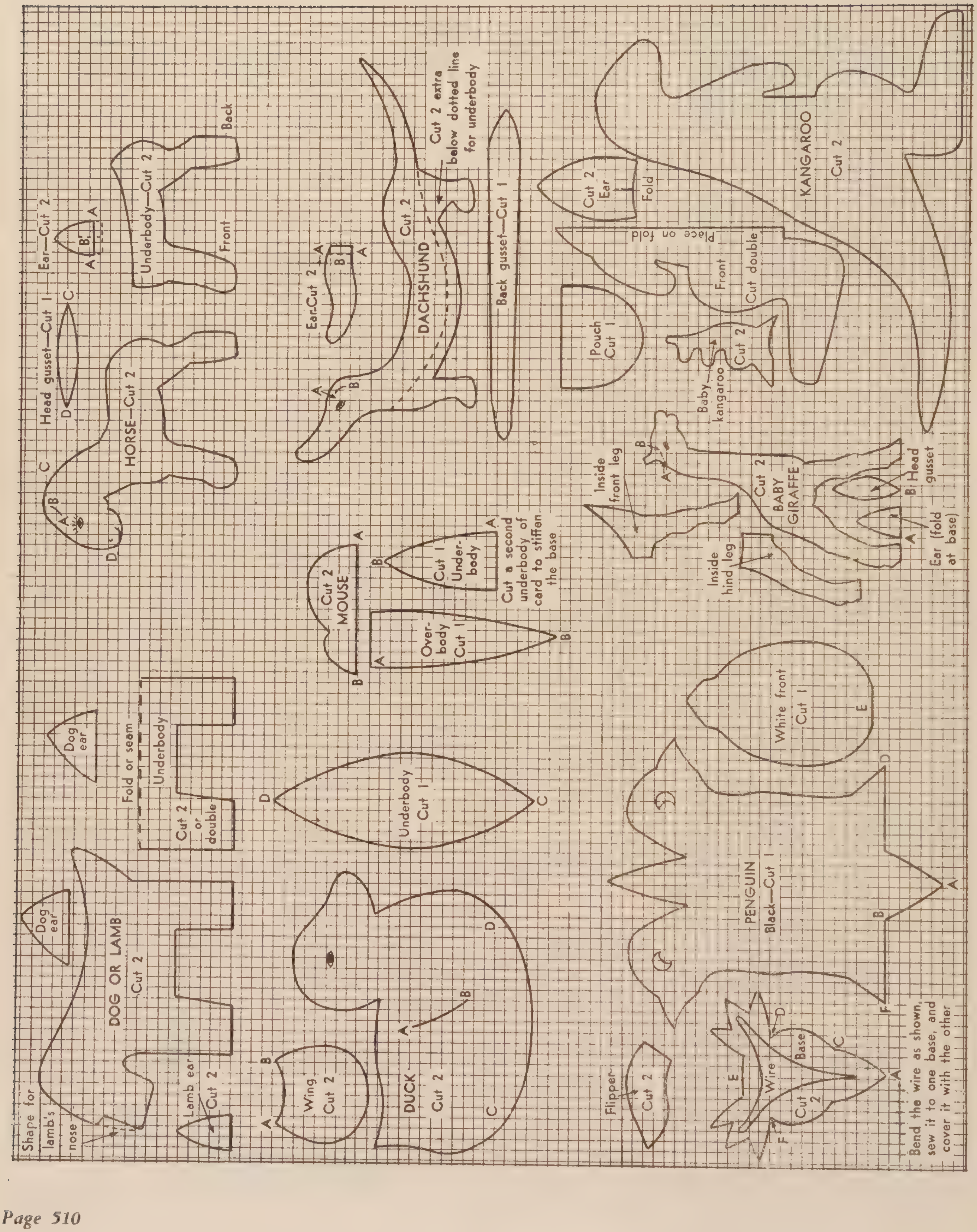
Making and fringing an extra seam allowance were explained earlier in this article. Manes may also be made from scraps of fur or fleece sewn on after the animal has been stuffed, or from lengths of wool or other threads knotted along the top of the neck, as for the fringe on a scarf. Real feathers are not satisfactory, as they break and look shabby too quickly.

Animals with spotted coats should have their spots added after they have been made and stuffed. Those of the baby giraffe in the photograph were put on with indian ink, but many other ways may be devised—a leather animal may be marked with a hot poker, a spotted fabric may be used, and embroidery, stencilling, or applique are all suitable.

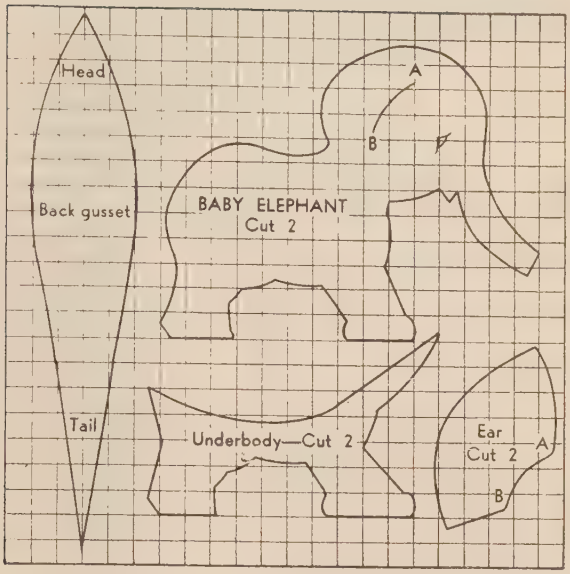


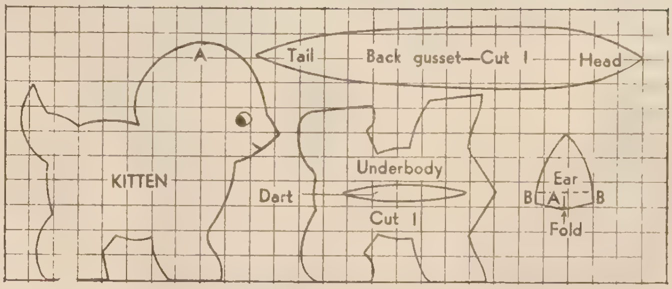
Ear patterns. Upper—African and Indian elephants, dog (long and short), and deer (before and after being folded). Lower—Bear, horse, and rabbit (all before and after being folded), and cat.

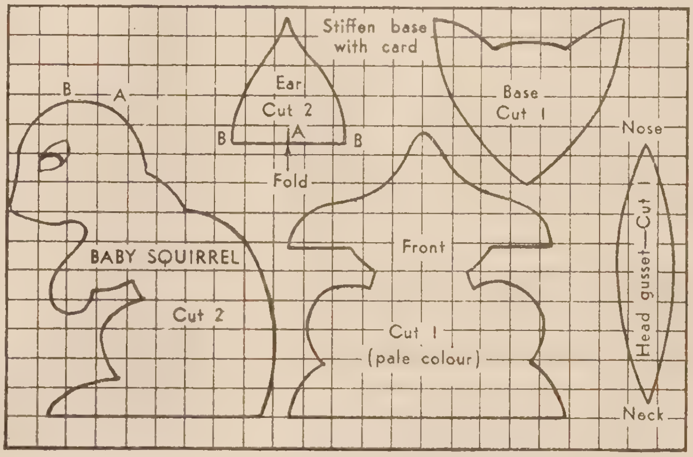
# PATTERNS FOR FELT TOYS


Shape for lamb's nose
Dog ear
DOG OR LAMB
Cut 2
Lamb ear
Cut 2
Dog ear
Fold or seam
Underbody
Cut 2 or double
Head gusset—Cut 1
Ear—Cut 2
HORSE—Cut 2
Underbody—Cut 2
Front
Back
Wing
Cut 2
DUCK
Cut 2
Underbody
Cut 1
MOUSE
Cut 2
Over-body
Cut 1
Cut 1
Under-body
Cut a second underbody of card to stiffen the base
Ear Cut 2
DACHSHUND
Cut 2
Cut 2 extra below dotted line for underbody
Back gusset—Cut 1
Cut 2
Ear
Fold
Place on fold
Front
Cut double
KANGAROO
Cut 2
Pouch
Cut 1
Baby kangaroo
Cut 2
Inside front leg
Cut 2
BABY GIRAFFE
Inside hind leg
Head gusset
Ear (fold at base)
White front
Cut 1
PENGUIN
Black—Cut 1
Flipper
Cut 2
Wire
Base
Cut 2
Bend the wire as shown, sew it to one base, and cover it with the other
A
B
C
D
E
F

# PATTERNS FOR FELT TOYS







In all the patterns on this and the opposite pages each square represents ¼in. Therefore, if each square of a pattern is copied on to paper ruled with ¼in. squares, it will be restored to its original size. For a bigger horse or elephant, for example, the paper may be ruled in ⅜in. squares.

For fanciful animals such as a pink elephant or a purple horse the fancifulness may be increased with embroidery which is not in the least realistic, but such embroidery should not be used on animals of a realistic colour and shape. Use stitches that will wear well, put them on after the animal has been finished in other respects, do not put on too much, and make the embroidery follow the lines of the animal. Much amusement can be had from the skilful application of such decoration, but it must not be overdone.

### Variation in Detail

Finally, variation may be introduced when making up standard patterns by such additions as clothes, harness, hats held on with elastic, pockets and handkerchiefs, and school bags. The elephant in the photograph is green with a scrap of red cotton print sewn on as a saddle. The horse has felt harness and wool reins. The kangaroo has a pouch with a baby kangaroo attached by a long string to the inside of it. The donkey has felt paniers, and these are popular for carrying marbles or even the two kittens also shown in the photograph. A dog should have a collar and perhaps a lead. A kitten or a lamb may have a ribbon and a bell. A rabbit could have a small orange-coloured felt carrot sewn to his paws or his mouth. A giraffe may have a piece of greenery in his mouth, or a monkey may be holding a half-peeled banana. If the toymaker takes time to add these finishing details, she adds greatly to the enjoyment obtainable from the toys by the children, and she can vary a standard pattern endlessly.

Still another way of varying patterns is to make up the animals in families. Big horse and baby horse, big squirrel and baby squirrel are shown in the photograph. Mother duck and her ducklings are popular. Mother, father, and baby giraffe would make a fine family, and mother, father, and baby bear with a Goldilocks would please all lovers of the fairy story immensely.

**Toymaking is an art that gives great joy both to the maker and to the ultimate owner of the toys. It is cheap and fascinating and well worth studying so that it may be done successfully.**

**References**

"Toy-making," by Mabel Early, "How to Do It" Series No. 34, Studio Publications, London and New York.

"Make Your own Soft Toys," by Ruby Evans, Lutterworth Press, London and Redhill.

"Dressed Soft Toys," by Edith Moody; "Felt Toys," by E. Machrie and I. P. Roseman; "Rag-bag Toys," and "The Making of Soft Toys," Dryad Press, Leicester.

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## A Quick and Easy Method of Cleaning Table Silverware

WHEN forks and spoons become tarnished and the housewife has no soda handy for the electrolytic cleaning method (described in the "Journal" for November, 1948), another simple and cheaper method is to put the silver in a large aluminium saucepan with a small piece of ordinary soap, cover it with hot water, and bring it to the boil; continue boiling until the silver is quite clean, then pour off the soapy water and rinse the silver in clean hot water before drying it. If this is done immediately after a meal, the hot soapy water may be used for the washing up.

This method causes very little blackening of the aluminium, and the saucepan can be brightened again by stewing fruit in it, which does not harm the fruit or the pot. The longer the soapy water is boiled in the saucepan, the greater the blackening of the aluminium, but it is not necessary to boil the silver for long to clean it.

If too much water is put in the saucepan, and especially if too large a piece of soap is added as well, when it boils the soapy water is very likely to boil over. To avoid this a large saucepan should be used so that the silver will lie fairly flat in it and the saucepan does not have to be nearly filled to cover the silver. The saucepan must be aluminium.

*—EIRENE E. UNWIN,*
*Rural Sociologist, Department of Agriculture, Dunedin.*

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# Christmas Decorations

PREPARATIONS for Christmas loom large in the future of every family at this time of year, and especially in families with young children. Following articles on paper cutting and tearing and picture making in the two previous "Journals," in this one of the series on child care and development Dorothy Johnson, Rural Sociologist, Department of Agriculture, Christchurch, shows how the preparation of Christmas decorations can be made a co-operative family enterprise.

SEVERAL times in these articles it has been suggested that the objects that children make, even in paper, can and should be used in various aspects of the life of the home, both in the day-by-day ones and on those more special occasions which mark the social festivals of the year, such as birthdays. Probably the most important to the child and in his development is his own birthday. Being in the centre of the picture for a day, surrounded by presents that are tokens of the love and affection in which he is held, not only deepens his feeling of security, but also satisfies his need of significance in the family group. If the occasion is marked by a party, he can contribute to the festive preparations by decorating the places of the guests with paper mats, folding table napkins for them, and making doilies for the cake plates.

## Most Important Birthday

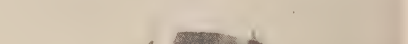
Directing his energy in too concentrated a fashion for any specific occasion is a mistake. A small child can do only very little at once, as his powers of concentration are slight, but the things he makes can be put away when his attention is focused on something else, or when he is asleep, and produced later for the birthday celebrations as his work and his contribution to the preparation. That is true chiefly for the tiny tots. The older ones can do more at one time and are capable of planning and working for more remote and special occasions such as Christmas. This is the most important birthday of the year, celebrating the coming of love itself, thus enhancing the significance of the birthdays of individual members of every family. That this is so is symbolised by the more general decoration of the house for the Christmas season, generally stimulated, it must be admitted, by the abundance of mass-produced and stereotyped decorations which fill the shops at this time.

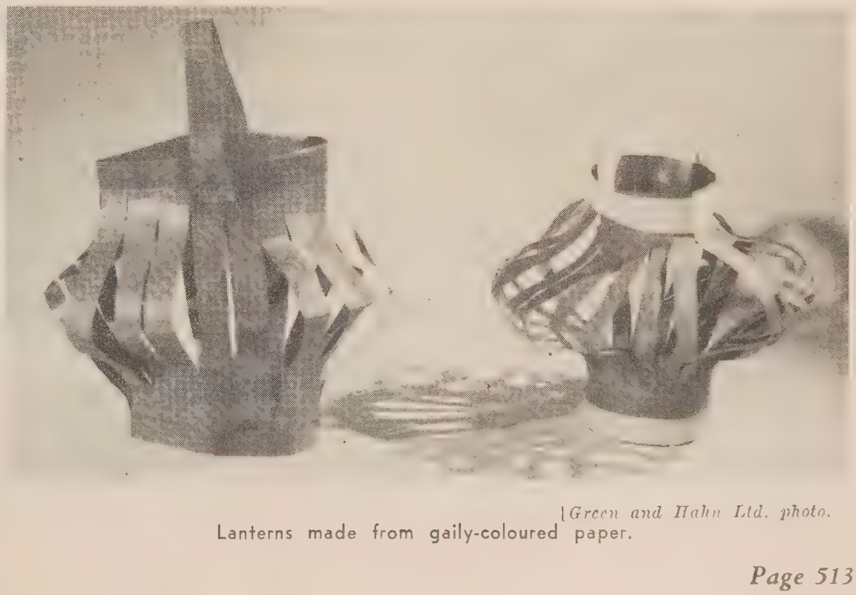
Would it not be better for a family to produce its own Christmas decorations, sometimes indirectly, sometimes purposefully? Last month's article in this series dealt with the gradual making of a picture of a Christmas tree, either on a life-size scale as a combined family effort or on the individual level to form a mantelpiece frieze in the decorative scheme. From the various types of paper work other Christmas decorations can be made.

## Coloured Paper Chains

The simplest wall decorations are the coloured paper chains in the making of which everyone can lend a hand.

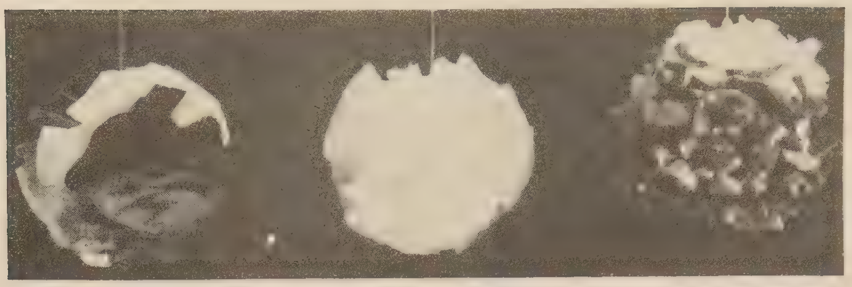
One kind is made by folding a 2in. strip of paper into 16 thicknesses and cutting it as shown in the illustration. Many strips can be gummed together for festoons for walls and ceiling.





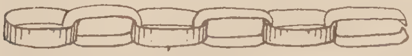
[Green and Hahn Ltd. photo.

Lanterns made from gaily-coloured paper.



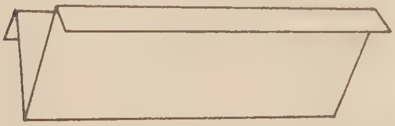
Paper balls. [Green and Hahn Ltd. photo.

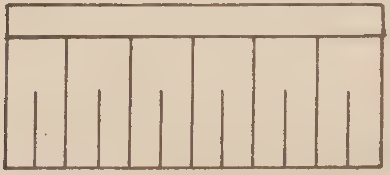
Another type of chain is made by linking small strips of paper together, each piece being 2in. by 8 or 9in., and pasting the ends together. These chains give greater scope for individual choice in colour combinations. Sheets of coloured paper, gummed or plain, are readily procurable. If lanterns and paper balls are hung from the festoons the result is most attractive.



## Lanterns

Brightly-coloured paper can be used to make lanterns of various sizes. Fold a piece of paper in halves and then fold down $\frac{1}{2}$ to $\frac{3}{4}$in. along the top edges. Make alternate long and short vertical cuts with scissors along the length of the paper, the long ones reaching just up to the folded edges.



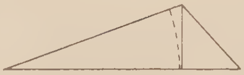


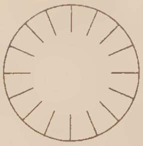
Open out the paper, join the ends in a ring, and paste a handle on. A strip of paper of contrasting colour can be pasted round the top to hold the handle.

## Paper Balls

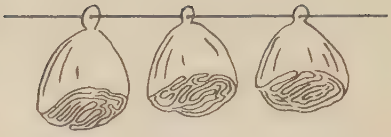
Two attractive types of balls can be made from tissue paper. The middle one in the photograph on this page was made with only white paper and the other two with white, green, black, and red.

A ball like the right-hand one is made as follows: Cut a square of tissue paper and fold it into four small squares. Fold the small square diagonally and then fold along a line from the apex of the triangle to the centre of the paper. The paper now has 16 thicknesses, but some of the folds do not reach all the way to the end.





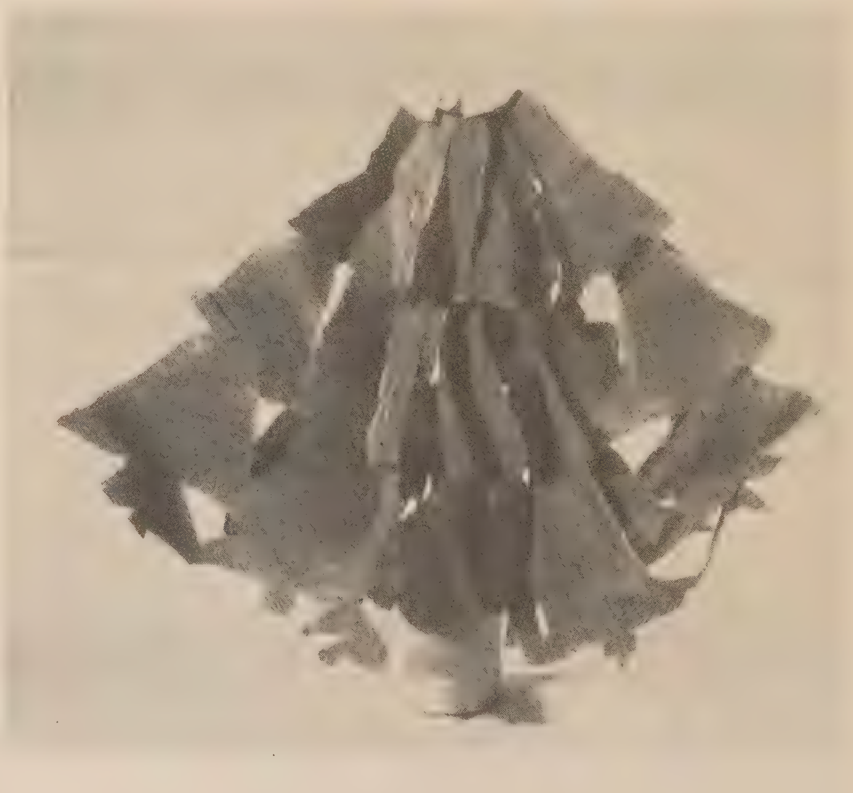
Cut the extra pieces off along the dotted line. Open out the paper and it should form a circle. Make 16 cuts in the circle and twist each little strip so formed. Make a number of circles in different-coloured paper and thread them through their centres on a string, arranging them in a ball form. To finish off, thread the string several times through the centre of the ball, leaving a piece by which to hang it up. Paper balls like these are more fun if made by a group of children and adults together, and the balls grow more rapidly. To make one would be a very tedious task for a small child alone.



The second method is perhaps easier and quicker. The circles of paper are made in the same way, 12 at least being needed. Pick up each one at the centre with one hand and run it through the fingers of the other hand to the edge, turning it into a small, rough segment of a ball, and thread them together.

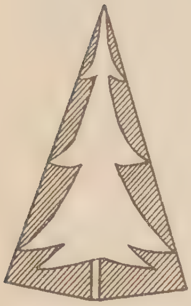
## Cut-out Strips

The strip cutting described and illustrated in the September "Journal" can be used most effectively for Christmas decorations. The designs given for candles, bells, Father Christmas, dolls, teddy bears, baskets of flowers, and animals all fit into the Christmas celebrations. They can be made in the winter evenings or on wet holidays, and after a preliminary display at the time of making can be stored away until December. The season's achievement makes a grand showing at Christmas—a family co-operative effort, though the parents probably contribute the lion's share in the family's earlier years. When put up on the wall these paper strips can be hung in one long chain or each figure can be separated and pasted on a long strip of paper to form a frieze.



[Green and Hahn Ltd. photo.
A fir tree made from green crepe paper.

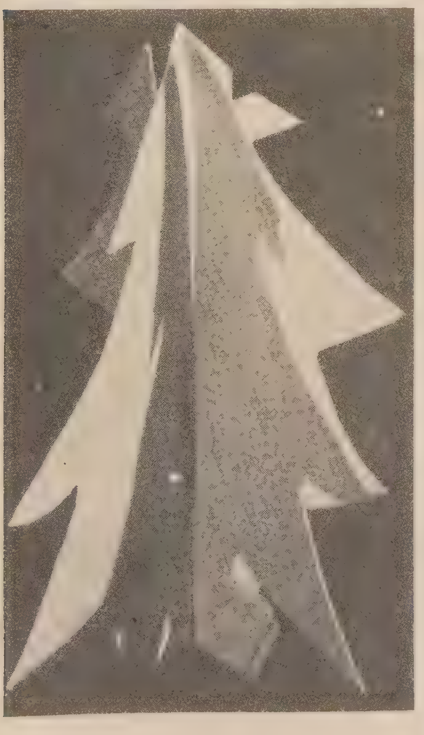
## Fir Trees



In addition to wall decorations and the Christmas tree itself, miniature fir trees made to stand up by themselves can be used as a motif in the table decorations.

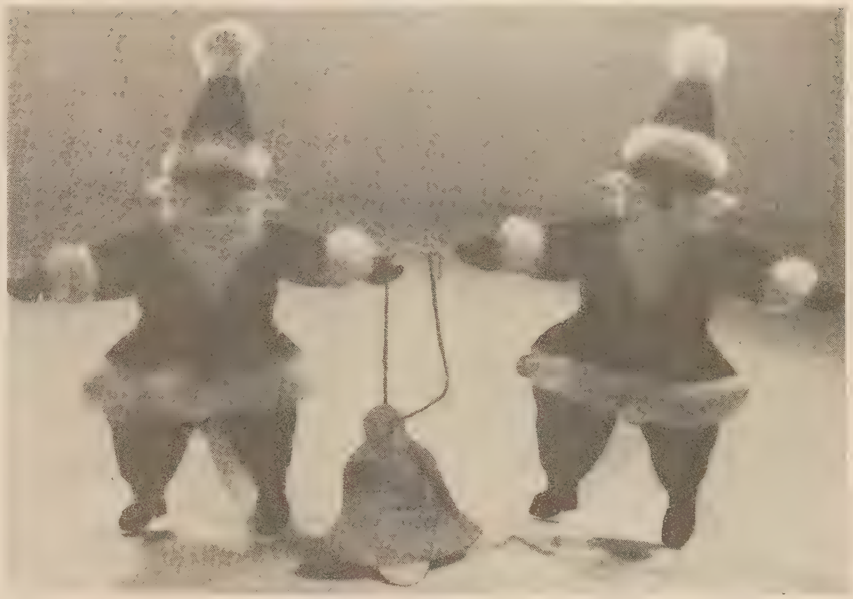
Fold and cut paper as for a circle but do not open it out flat. Cut the tree outline as shown in the diagram. Take care not to cut the tree quite to a point at the top, but leave the last ¼in. uncut. Fix a stick into a cork, place the top of the tree on the point of the stick, and gum it securely. Arrange the ends of the branches in position, fixing them with a spot of gum. If larger trees are required, use a small plant pot instead of a cork.

So far only the softer kinds of paper have been used. Another very effective tree can be made from stiff green paper or carton paper. Two oblong pieces are needed. Fold each in halves lengthwise and cut out the shape of the tree. Various shapes can be used, one being shown in the photograph on this page and another in the diagram. The two pieces are fitted together by complementary slits, on one piece cut on the fold halfway down from the top and on the other cut halfway up from the bottom. Slip one slit through the other at right angles, and there is a tree that stands by itself.



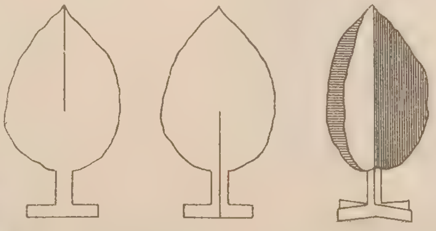
[*Green and Hahn Ltd. photo.*

The type of stand-up tree which can be made from two pieces of carton paper.



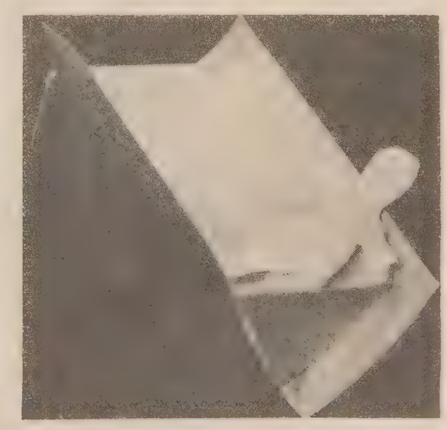
[*Green and Hahn Ltd. photo.*

Carton-paper cut-outs of Father Christmas, the making of which is described below.



## Tree Ornaments

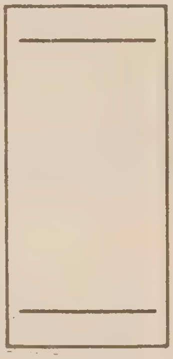
From carton paper, bells can be made either in varied colours or covered with silver paper from chocolates. These can hang on the real tree. So can attractive little carton-paper statues of Father Christmas himself. The merry dancing ones illustrated were cut from red carton paper, with features, belts, and boots put on with indian ink and carefully-fluffed cotton wool gummed on for the fur trimming. They can be hung on the tree or wall by cords.



[*Green and Hahn Ltd. photo.*

Paper cradle and child.

**Of course, if the children have made a picture of Father Christmas and his bag of toys as described in last month's "Journal," it will have pride of place in the living room during the Christmas season.**



Finally, the Christmas story calls for cradles or mangers and babies. The one illustrated can be made simply in any size to suit. An oblong of coloured paper is slit at the sides as shown in the diagram and the rockers cut and fixed as in the photograph. On the dinner table the cradles can hold sweets or nuts for individual guests.

## Family Achievements

The activities described by no means exhaust the possibilities. Circumstances determine what any one family will achieve. On the mother, with much assistance from the father, will fall the essential stage management that will produce the ideas and the raw materials for interesting occupations at various times of the year, and she will also fit them into the major project for the Christmas season. Stored away piece by piece and forgotten, they will be hailed with pride and delight on their reappearance later, astonishing even the parents with the evidence of creative co-operative family achievements to celebrate the festival which comes first in the hearts of all children.

# SUN SUITS

FOR summer days, simple sun suits which are easily washed and ironed are the ideal wear for active small boys. These garments receive hard wear and many washings, so sturdy materials and workmanship are essential. To encourage self-reliance in the wearers and to lighten the mother's tasks during the hot weather, when everyone, old or young, wilts a little, fastenings should be simple and easily manipulated. Hooks and eyes, small dress fasteners, and very large or very small buttons are too difficult for little fingers, which, however, soon learn to fasten a medium-sized button and buttonhole. Some styles of garment can be adapted to make the fastening arrangements easier, and construction can be simplified to save time when sewing. The sun suit described by Eva Topping, Rural Sociologist, Department of Agriculture, Auckland, has only two fastenings and few pattern pieces, so it is quickly cut out and stitched, easily put on, and takes little time to iron—all points of special advantage where the family includes several small children.

THE suits illustrated will fit boys of 2 to 3 years. The measurements of a completed suit cut to the pattern given are: Waist 22in., outside leg seam 8½in., waist to crutch at front 9in., inside leg seam 1½in., bib 5½in., and length of shoulder strap 12½in.

Cut out a pattern in paper by following the directions under the diagrams on the opposite page. No pattern need be made for the straps or waist facing. The straps are straight pieces 13½in. by 3½in., and the waist facing is cut on the true cross 23in. by 3in.

Cut out the pattern pieces and mark the position of the flap as shown on the diagram. Turnings of ½in. are allowed for on all seams, 1in. on the hem for the legs, 1in. for the top hem of the bib, and ½in. for the side hems.

A yard of 36in.-wide material is ample for one suit in this size, and 2½yds. will make three garments. Two buttons are needed for each suit.

Lay the pattern on the material, leaving sufficient space for straight pieces of the required length for the straps and enough for the crossway piece for the facing. If the material is cotton, linen, lightweight woollen, or synthetic, french seams are not too bulky and save the time needed for neatening single seams.

Stitch in the darts of the two trouser backs, tapering them to fine points at their lower ends. Press the darts back toward the centre back. Join the back seam.

Stitch round the curve of the front flap, trim the seam, turn the flap right side out, and press it. Stitch it into place on the right front between the two marks. Join the front seam, leaving it free over the flap. Hem the left front narrowly at the opening. Trim the flap seam and neaten the edges.

Join the two side seams, then stitch the leg seam. Turn up the hem at the legs and stitch it by hand, making invisible stitches on the right side.

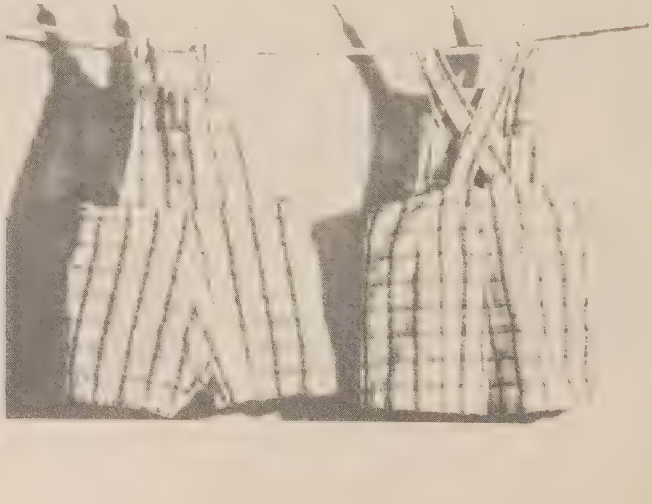
Join the long edges of the shoulder straps and turn them right side out. Cut the back ends at an angle and tack them in place ½in. from the back seam with the shorter sides toward the centre.

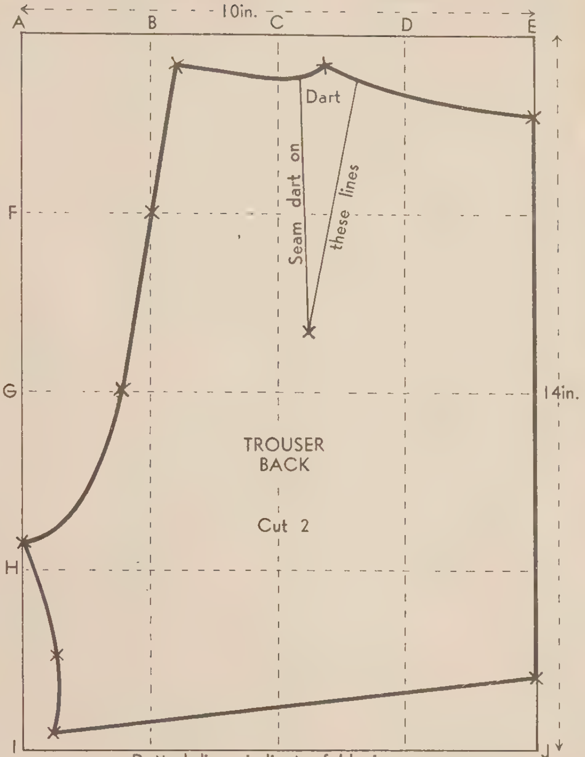
Turn ¼in. hems on the sides of the bib and a ¾in. hem at the narrower edge, which is the top. Stitch round continuously. Set the centre of the lower end of the bib at the front seam, right sides together.

Join the crossway strip for the waist facing and set it on the right side of the trousers. Stitch round ¼in. below the raw edges, catching in both straps and bib, then press the facing over to the inside of the garment. Make a ¼in. hem on the lower edge of the facing.

Make buttonholes on the top corners of the bib and sew buttons in the right places on the straps. The straps are longer than necessary at first so that the buttons can be moved down as the child grows taller.

All photographs by Sparrow Industrial Pictures Ltd.





Dotted lines indicate folds in paper

Take a piece of paper 10in. x 14in. Fold it in four lengthwise then again in four crosswise. Open the paper out and, using the creases as a guide, make pencil crosses at the following points:

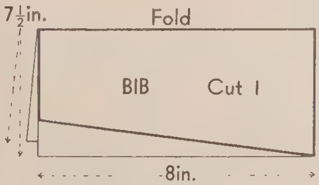
1½in. down from E; ½in. down and ½in. to the right of B; ½in. down and 1in. to the right of C. Join these three marks for the waistline as shown in the diagram.

The intersection of the two creases to the right of F; ½in. to the left of the intersection opposite G; ½in. above H. Join these three marks as shown in the diagram, and continue the line to the end of the waistline, thus making the back seam line.

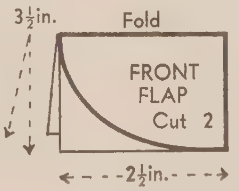
½in. in and ½in. up from I; 1½in. down and ¾in. in from H. Join these two marks, and continue the line to the end of the back seam line for the leg seam line.

1½in. up from J. Join to the bottom of the leg seam line.

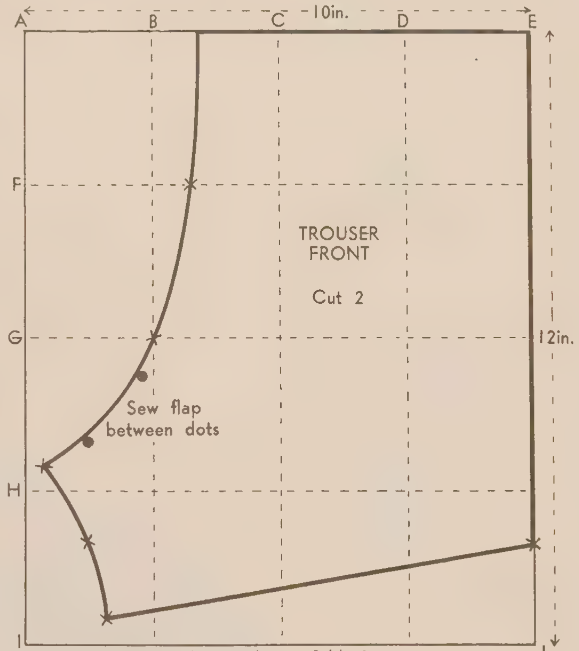
For the dart in the back draw a straight line parallel to crease C 5in. long and ½in. to the right of the crease. Join the lower end of this line to a point 1in. to the right on the top edge of the pattern.



Take a piece of paper 7½in. x 8in. and fold it in halves as shown. Make a mark 1in. up from one lower corner and join it to the other lower corner with a straight line.



Take a piece of paper 2½in. x 3½in., fold it in halves crosswise, and draw a smooth curve as shown.



Dotted lines indicate folds in paper

Take a piece of paper 10in. x 12in. and make crosses at the following points:

1in. to the right of B; ¾in. to the right of the intersection of creases to the right of F; at the intersection of creases to the right of G; ½in. up from and ½in. to the right of H. Join these marks to make a smooth curve for the back seam as shown in the diagram.

1½in. to the right of I and ½in. up; 2in. up from J. Join these two marks with a straight line.

1in. down from H and 1¼in. in. Join this mark to the back seam and leg to give the inner leg seam.

Chicken Pie
Roast Chicken
Fried Chicken

# Poultry Cookery

**IN New Zealand, where poultry is eaten less than in some other countries, housewives tend to reserve it for a Christmas treat. In this article Edith G. McNab, Rural Sociologist, Department of Agriculture, Dunedin, provides some general information about choosing, preparing, and cooking poultry and gives a variety of recipes, so that choice of a method of cooking need not be restricted to the usual stuffed roast fowl. An article in this issue by W. L. McIver, Poultry Instructor, Hamilton, deals with plucking, drawing, and trussing fowls.**

IF poultry is to be bought, the housewife needs to go shopping with some knowledge of how to judge the age and tenderness of a bird. Old birds are likely to be tough. Choice of cooking methods is governed to a considerable extent by the age of the bird. The feet and legs of a young bird are soft and smooth, and with age the legs become coarser and scaly. The skin of an old bird is coarser than that of a young one. The best test for age is to press the end of the breastbone furthest from the head; if the bird is young, there is a decided "give" in the bone, but the end of an old bird's breastbone is quite hard and rigid. In ducks and geese the hardness of the windpipe increases with age, so the windpipe of an old bird is less easily indented when pressed.

Freshness can be judged by the condition of the feet, eyes, skin, and flesh: The feet should be moist and soft rather than hard and dry; the eyes should be bright and full, not shrunken; the skin should be clear, unbruised, and unbroken; and skin and flesh should be soft yet firm and not flabby.

A plump, compact, well-fleshed bird has a higher proportion of meat to bone than a bird with long bones. About an eighth of the weight of a bird is lost in dressing and about another fifth in drawing, so the weight of a dressed and drawn bird is about two-thirds of its live weight.

## Preparation and Stuffing

As the flesh is protected by a skin outside and a membrane inside, a fowl may be washed, but it should not be soaked in water. The simplest way is to allow a stream of water to run through the body cavity and then dry the bird.

The type of stuffing depends on the type of poultry. The mild flavour of chicken and turkey should not be masked by too strong a flavour in the stuffing. Duck and goose flesh is naturally fat—much more so than that of chicken and turkey—so a dry stuffing soaks up fat during cooking. For ducks and geese sharply-seasoned or tart fruit stuffings are best.

Breadcrumbs form the foundation for most stuffings. Salt, pepper, herbs, and perhaps nutmeg are added. Onion which has been chopped and browned in fat may also be added. Fat is the usual binding ingredient, but if the poultry is to be served cold, slightly-beaten egg as a binding helps the stuffing to hold its shape. Other additions to stuffings may be ham or bacon (for fowl, turkey, and rabbit), oysters (for fowl and turkey), sausage (for turkey and rabbit), and apple or orange (for duck or goose).

When a bird is being stuffed the cavity should be not quite filled, for the stuffing swells during cooking. The bird should be trussed as directed in the Poultry Instructor's article. Openings must be well secured so that the stuffing does not escape. If they are sewn up, the thread is removed after the bird has been cooked and before it is sent to the table.

## Cookery Methods

As with other meats, too high a temperature increases the loss of weight during cooking and decreases the tenderness and juiciness of poultry. Therefore a bird should be cooked at a temperature below browning point for most of the time, or below boiling point if it is being cooked by moist heat.

Young, very tender poultry may be fried, for this method of cooking supplies fat, which tends to be lacking in young birds. More mature but still young birds may be roasted. If there is any doubt about the tenderness of a bird for roasting, it may be pot roasted, or it may be partly cooked for 20 minutes in a pressure cooker or by being simmered in salted water for 2 hours, then stuffed,

Heading photograph by Sparrow Industrial Pictures Ltd.

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IT'S the egg that does it! By actual scientific test, the egg in Richard Hudnut Egg Creme Shampoo makes your hair easier to comb, easier to set. You'll twirl pin curls smoother so they're bound to last longer! And see how much better your Richard Hudnut Home Permanent "takes" after this shampoo! Gentler, kinder, too! No wonder your hair is left shimmering with "lovelights"! It's really a wonderful shampoo — *try it!*

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## Shampoo is better because:

1. Enriched with egg — proved to make hair more manageable.
2. Not a wax or paste — but a smooth *liquid* creme!
3. Easy to apply; rinses out readily.
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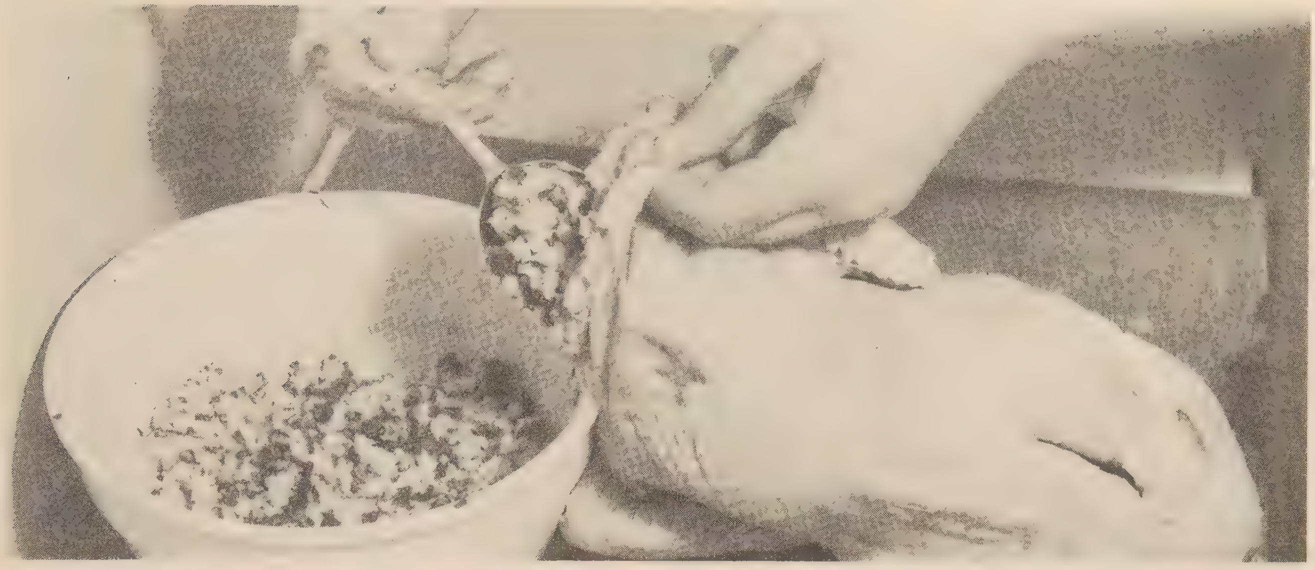
5. Same shampoo as the Richard Hudnut Fifth Avenue Salon uses for luxury treatments!

**AT CHEMISTS AND DEPARTMENT STORES**

*Prepared by*
Richard Hudnut Ltd., 21 Federal Street, Auckland



[Sparrow Industrial Pictures Ltd. photo.

When a bird is being stuffed the cavity should be not quite filled.

and the cooking finished by roasting. Older birds may be boiled, braised, or cooked in a casserole.

## Recipes

Rabbits may be cooked by any of the methods described in the following recipes for poultry.

### Stuffed Roast Fowl

- 2 cups of soft breadcrumbs
- 2oz. of chopped suet
- 2 tablespoons of chopped parsley
- ½ teaspoon of grated lemon rind
- 1 teaspoon of salt
- ½ teaspoon of pepper
- 1 teaspoon of mixed herbs
- 1 slightly-beaten egg
- Milk to mix

This yields enough stuffing for a medium-sized bird. For a large bird the recipe may be increased to 3 cups of breadcrumbs, with the other ingredients in proportion.

**Oyster stuffing** is suitable for a special occasion. The recipe is:—

- 2 cups of soft breadcrumbs
- ½ cup of melted fat (butter if available)
- ¼ teaspoon of salt
- ¼ teaspoon of pepper
- ½ teaspoon of herbs
- 1 beaten egg

Mix all the ingredients together and add an equal bulk of oysters. These quantities make enough stuffing for a large fowl.

After securing the openings so that the stuffing cannot escape, truss the bird to improve the appearance, make carving easier, and reduce the risk of burning. Place the bird breast side up in the roasting pan, and either rub it with oil or fat and baste it from time to time or place some slices of fat bacon over the top. Do not cover the pan. Turn the fowl over for the last 20 minutes of cooking. Either begin cooking at 450 degrees F. for 20 minutes then reduce the heat to 300 degrees for the rest of the time, or roast the bird for the whole time at 325 to 350 degrees. Allow 20 to 25 minutes per pound of dressed weight for cooking. The time may range from 1½ hours for a small bird to 2 hours for a fully-grown fowl.

### Roast Goose with Apple and Raisin Stuffing

- ½ cup of diced salt pork or bacon
- 1 cup of chopped celery
- 1 cup of chopped onion
- 7 cups of soft breadcrumbs
- ¼ cup of sugar
- ½ cup of chopped parsley
- 6 medium-sized tart apples, diced
- 2 tablespoons of salt
- ¼ tablespoon of pepper
- 1 cup of seedless raisins

Fry the bacon, remove it from the pan, and cook the celery, onion, and parsley in the fat for 3 minutes. Remove the vegetables. Put the apples in the pan, sprinkle them with the sugar, and cook them slowly until they are glazed. Mix all the ingredients. If more liquid is needed, use egg and milk. This makes enough stuffing for a 10 to 12lb. bird.

After securing the openings and trussing the bird, roast it as directed for roast fowl, allowing 20 to 25 minutes per pound.

[Sparrow Industrial Pictures Ltd. photo.

A chicken for roasting placed breast side up in the pan with slices of fat bacon on top.

# RECIPES FOR COOKING POULTRY . . .

### Stuffing for Turkey

2lb. of lean pork or bacon
½ cup of soft breadcrumbs
½ teaspoon of herbs
1 teaspoon of salt
½ teaspoon of pepper

Mince the meat and mix all the ingredients, moistening them with a little stock. These quantities make enough for a medium-sized turkey.

### Boiled Fowl and Chicken Sauce

The fowl may be left whole or cut up. Half cover it with salted boiling water and simmer it, closely covered, for 2 to 3 hours, or even longer if the bird is old. The boiled fowl may be served with chicken sauce or it may be used for chicken fricassee, chicken pie, creamed chicken, or other recipes using cooked fowl. The stock may be used for sauce or soup.

The recipe for chicken sauce is:—

2 cups of chicken stock
4 level tablespoons of flour
4 tablespoons of fat (chicken fat or butter)
Seasoning

Brown the flour slightly in the fat. Add the stock gradually, stirring well until the sauce thickens and comes to the boil. The sauce may be varied by cooking the flour in the fat without browning it and adding 2 hard-cooked eggs cut in ¼in. slices to the finished sauce.

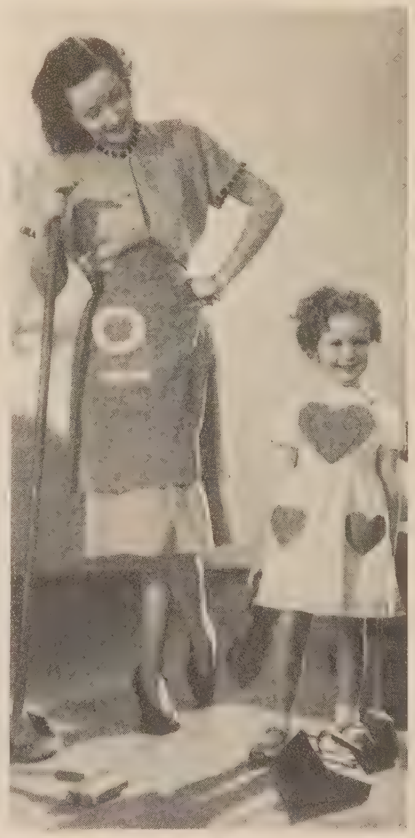
### Fricassee of Fowl

Use a boiled fowl which has been cut up before being cooked. Drain the pieces and keep the stock for the gravy. Roll each piece in flour seasoned with salt and pepper and fry them in a little fat until they are brown. Make gravy by browning flour in fat (3 tablespoons of flour and 3 tablespoons of fat for each cup of liquid) and adding stock gradually, stirring well to avoid lumps. Season the gravy and simmer the browned pieces of meat in it until they are quite tender.

# APRONS for MOTHER and DAUGHTER

GAY aprons for the housewife and her little helper bring brightness to the routine of household tasks. An apron such as this mother's requires a piece of material 34in. wide by 22in. long, two strips 4½in. by 19in. for a waistband, and two ties 3in. by 28½in. Shape one long edge of the waistband strips with three curves, the centre one 4in. deep and the side ones 3in. deep, sloping to 1¾in. at the ends. Place the right sides together and stitch along the shaped edges. Make up the ties and join them to the band ends. Hem 22in. of the sides of the apron. Make three pleats each side of the top to fit the waistband and insert the band. Hem the lower edge. Cut a pocket in flowerpot shape and sew down three sides. Make a sunflower 5in. across and two leaves and sew them to the apron.

The child's apron is made from a duster 24in. square, a piece of contrasting material 16in. by 10in., and three buttons. Cut a piece of duster 21½in. by 13½in., a waistband 12in. by 3in., two ties 9½in. by 3in., and two straps 16in. by 1½in. Gather along one long side of the apron. Fold the waistband in halves lengthwise and insert the gathers. Sew the ties folded in halves and stitched to the waistband ends. For the bib cut two constrasting heart shapes 7in. by 6in. and four pocket heart shapes from 4in. squares. Stitch the hearts together in pairs and turn them to the right side. Sew the point of the bib to the centre of the waist. Sew on the pockets. Hem the shoulder straps and stitch them to the bib. Make buttonholes at the other ends. Stitch a buttonhole at the end of the right tie and a button on the left tie. Stitch a button on the ties to correspond with the shoulder straps.



### Chicken Pie

Meat from 1 boiled fowl
1 medium-sized sliced onion
¾ cup of chopped celery (can be omitted if not available)
2 tablespoons of fat (chicken fat, bacon fat, or butter)
2 tablespoons of flour
2 cups of stock
1 egg, cooked hard and sliced
Salt and pepper

Cook the vegetables in the chicken stock, strain them, and add them to the cut-up meat. Cook the flour in the fat and make a sauce with the stock. Add seasoning, meat, and vegetables, bring the mixture to the boil, and pour it into a greased casserole. Top it with the egg slices and arrange rounds of scone dough on top while the chicken mixture is still hot. Bake the pie in a hot oven (425 degrees F.) for 15 to 20 minutes.

To make the scone mixture for the pie crust mix 2 cups of sifted flour, 4 level teaspoons of baking powder, 2 level teaspoons of fat, and ½ teaspoon of salt with about 2/3 cup of milk.

### Creamed Chicken

4 tablespoons of flour
4 tablespoons of butter
1½ teaspoons of salt
¼ teaspoon of pepper
1 cup of milk
1 cup of chicken stock
2 cups of cooked and diced chicken
Buttered toast
Parsley

Make a sauce by cooking the flour in the fat and stirring in the milk and chicken stock gradually. Add the chicken and seasoning and heat the mixture. Serve it on the hot toast, sprinkled with chopped parsley.

### Fried Chicken

Cut a young fowl in serving pieces, wash them in cold water, and drain them, but do not dry them. Sprinkle the pieces with salt and pepper, dredge them thickly with flour, and fry them in bacon fat in a heavy pan until they are well browned and tender. If the fowl is not young, cover the pan closely after browning the meat and cook it until it is tender, or boil it until it is almost cooked and then fry it.

Serve the chicken with white sauce, made by the same method as that described for creamed chicken from 4 tablespoons of fat, 4 tablespoons of flour, 2 cups of top milk, and seasonings.

### Fried Rabbit or Duck with Orange Sauce

2 young rabbits cut in serving pieces
2 egg yolks, slightly beaten
1 cup of milk
1 cup of flour
1 teaspoon of salt
½ cup of fat

Combine the egg yolks and milk and stir them gradually into the flour and salt until the mixture is smooth. Dip each piece of meat in the batter and fry the pieces in the fat in a heavy pan. After browning them, reduce the heat and continue the cooking with the pan uncovered for another 30 to 40 minutes. Turn the pieces frequently.

Serve the rabbit or duck with the following sauce:—

½ teaspoon of grated orange rind
1 cup of orange juice
⅛ teaspoon of salt
2 tablespoons of flour
1 tablespoon of brown sugar

Mix the flour, seasonings, and sugar to a smooth paste with ¼ cup of water. Add the orange juice hot, stirring well, and cook the sauce until it is thickened, stirring all the time. Add the grated rind.

# THE MUSEUMS OF NEW ZEALAND

*IN the first article in this series, which appeared in the October issue of the "Journal," Enid B. V. Phillips traced the growth of museums generally and described the Dominion Museum, Wellington. This month she deals with the formation and development of the Otago and Canterbury Museums.*

## The Otago Museum

THE Otago Museum was established primarily as a natural history museum and its nucleus consisted of the rocks and natural history specimens collected by Dr. (later Sir) James Hector for the extremely successful New Zealand Exhibition held in Dunedin in 1865. The first meeting of the museum committee took place on July 1, 1868; the Provincial Government made its initial appropriation for museum purposes in 1873 and the Old Block in King Street was built in 1876-77, being opened as a public museum on August 11, 1877, with Captain Frederick Woolaston Hutton as curator. Hutton's catalogues of New Zealand birds, fishes, and mollusca had been compiled several years previously.

In addition to the notornis (a most beautifully preserved specimen 19½in. high, with vivid plumage of peacock blue, olive green, and indigo), the museum has mounted examples of native birds only recently extinct: The New Zealand quail, the screech-owl, the huia, the Stephen Island wren, the Chatham Island rail and fern-bird, the MacQuarrie Island rail, the Auckland Island merganser (the only sea-duck in New Zealand), and the New Zealand thrush. The sole spirit-preserved specimens of the two last-named species are also in the museum. Thanks to Professor Brian Marples's flair for field work the museum possesses more penguin fossils than those of all the rest of the world's museums put together, and rare birds are represented by the stitch-bird, the saddleback, and two varieties of wattled crow.

### Ferocious Rhinoceros

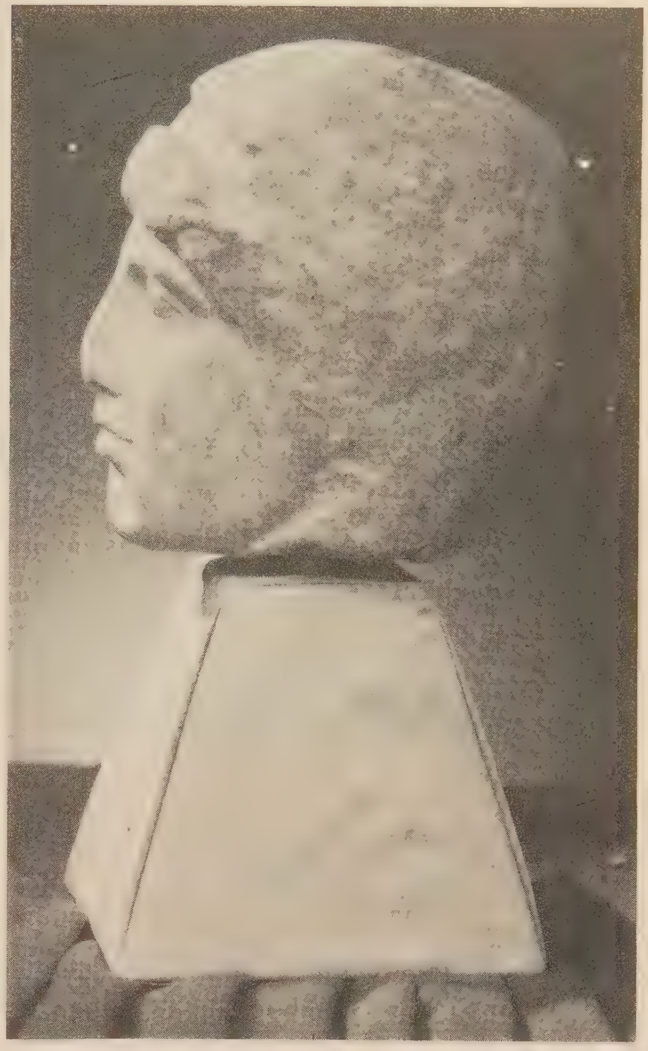
In the mammal section a two-horned Sumatran rhinoceros of gargantuan girth and ferocious mien has a claim to world fame, there being only six mounted specimens in existence, and this one is probably unique in that its skeleton has been preserved also. Its local prestige is due to its position as guardian of the door, and it is a well-known fact that the parental threat "Be good or the rhino will get you" has the power to intimidate the most boisterous youngster into near-perfect behaviour on his first visit to the museum. Dr. H. D. Skinner, who succeeded Sir William Benham as Director, reports a perpetual influx of elderly visitors whose principal purpose in making a pilgrimage to the museum is to see once again the monster which frightened them in their youth.

The new wing added to the north side of the museum in 1909 was named after the first lecturer in surgery at the University of Otago, Dr. Thomas Morland Hocken, who published that standard reference work "Bibliography of the Literature Relating to New Zealand" that same year, having donated earlier his extensive library of New Zealand books, prints, maps, and MSS. to the museum.

Twenty years later a similar extension was made to the south side, this modern structure being skilfully designed to harmonise with the Victorian architecture exemplified by the original building. It was called the Fels Wing in honour of Willi Fels, the museum's chief benefactor, who not only gave generously of his wealth and knowledge (and as a connoisseur of arts and crafts he had no superior in this country), but created the Department of Anthropology and endowed it with his own magnificent collections, every item of his gift being "meticulously catalogued in his neat handwriting."

### Boyhood Collections

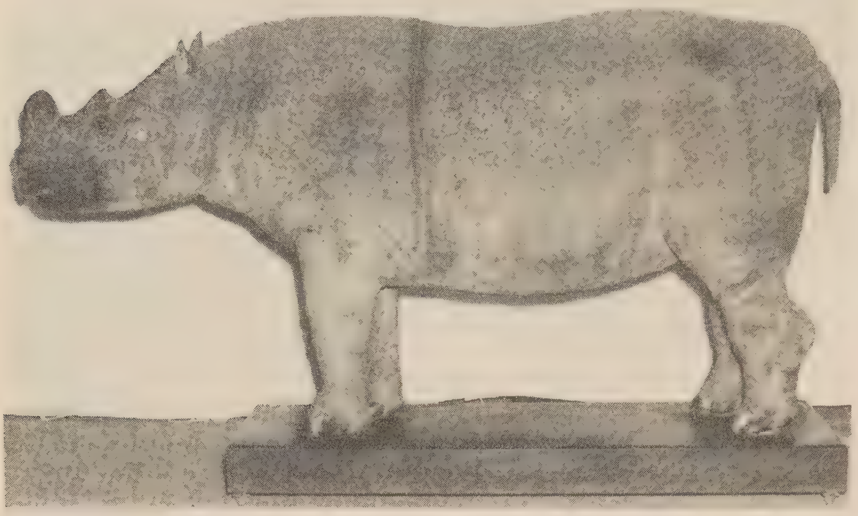
He began collecting during his boyhood in Germany, coins and stamps being his first loves. Soon after he arrived in New Zealand in 1888 to enter the head office of the New Zealand Clothing Factory (better known as Hallenstein Bros.) he turned his attention to Maori and Oceanic material and during the next decade he commenced the collecting of oriental arms. Ceramics and choice glass, too, appealed to him, as did objets d'art from India, Persia, Burma, and Japan, and Sir Francis Younghusband, the famous explorer, contributed a number of pieces to his Tibetan collection. But always his chief pleasure lay in his Greek and Roman coins, of which he had over 5000. Classifying and arranging these proved an absorbing occupation throughout the last years of his life.



The Otago Museum's head of a woman in marble, which is believed to be from one of the metopes of the Parthenon and which is very similar to the work of the great Greek sculptor Phidias.

### Classical Tastes Reflected in Garden

The garden at his home, "Manono" (the Samoan equivalent of his surname, which means "rock," both words signifying durability), also reflected his classical tastes, and gentians from the Italian hills grew there as happily as the hardiest of native shrubs, and cyclamens that once flowered amid some ancient Grecian ruins flourished among the ferns he brought back in such plenitude from his frequent travels in New Zealand. And at all times it was his joy to share his garden's bounty with others. Of this sterling citizen, upon whom the King conferred the C.M.G. for his outstanding contribution to the culture of the community, there is surely no more endearing word-portrait than that penned by the Director of the Otago Museum: "One likes best to remember him in the happy setting of his own home, presiding at his table with courtly hospitality, entertaining some small boy—he was always at his best



[Jack Welsh and Sons photo.
The two-horned Sumatran rhinoceros which stands at the entrance of the Otago Museum and which has become well known to several generations of children in Dunedin.

with children—discussing art and literature, or looking through his treasures with interested guests and friends."

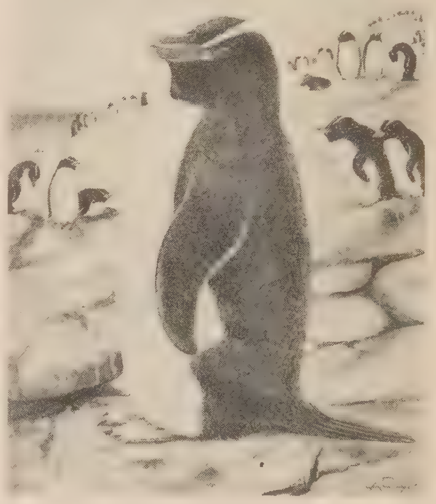
Among the Greek pottery and sculpture presented to the museum in memory of the late Willi Fels is the head of a woman in marble, said to be from one of the metopes of the Parthenon and the only specimen of Parthenonic sculpture in any collection outside Europe. An alabaster head of Pan is another aesthetically-pleasing piece, also a hydria (handled water-jar) of black-figured Attic ware belonging to the 6th century B.C. and showing Hercules in his chariot, his companion Hippocrates being almost hidden by the plunging horses. The scene where Ulysses and his men escape from the blind Cyclops' cave by clinging to the wool on the underside of the giant's rams as they were let out to graze forms the decorative motif on a graceful lekythos (oil vessel).

### High Ideal of Service

Some of these pieces as well as many exhibits from the Melanesian and Polynesian collections were sketched in black and white by Miss Lily Atty Daff (the officer in charge of exhibition from 1933 to within a month or two of her death in 1945) for the museum guide books, Dr. Skinner supplying the text. She designed the crest in present use, the snow-capped peak of Mt. Aspiring, symbolising the high ideal of service to which the museum aspires, and her line drawings in connection with Polynesian ethnography which were featured in the "Journal of the Polynesian Society" are the finest of their kind ever to be published in the Dominion. But it was in the realm of colour that she displayed her greatest genius, and her exquisitely-tinted paintings of native birds proved her to be without peer in this branch of art. Dr. Coolidge, of Washington, a member of the American delegation of scientists which recently visited New Zealand, said that he had never seen anything so beautiful of its kind as her exhibition case illustrating colour in the animal kingdom.

### Triumph over Lack of Knowledge

Fortunate indeed were the young folk who flocked to the Friday afternoon drawing class instituted by this brilliant and much-loved artist, who, though prevented by the poverty of her London girlhood from obtaining more than a fragmentary part of the art tuition to which her talents entitled her, nevertheless triumphed over lack of technical knowledge by sheer ability and painstaking diligence and did all in her power to foster in a practical manner the artistic gifts of the children with whom she came into contact.



[Campbell Photography photo.
One of the black and white drawings sketched by Miss Lily Daff for the Otago Museum.

[Campbell Photography photo.
The King Street frontage of the Otago Museum, with the Willi Fels wing on the right.

## Canterbury Museum

What Canterbury Museum lacks in Maori articles it makes up for by way of moa bones, some of the specimens found in the Glenmark swamp when the museum carried out field work there as far back as 1868 still being on display today. Other skeletons of these enormous wingless birds were sent overseas in exchange for foreign zoological and ethnographical material, thus greatly augmenting the museum's general collections.

Investigations commenced in North Canterbury in 1939 revealed a remarkable deposit of moa bones, many complete skeletons being unearthed, and the latest efforts of the staff engaged in excavations in Pyramid Valley

(Frank Metcalfe photo

The dignified Gothic-style building housing the Canterbury Museum. It was erected in 1870 and has been added to as the collections have grown.

area, near Waikari, have yielded moa bones by the truck load. The largest consignment to date comprised 68 skeletons, all carefully indexed and carried in numbered containers, except for the biggest bones, which reposed on top of the boxes, and it is calculated that their recovery necessitated the removal of 933 cubic yards of soil—no mean feat of digging. In fact, the total number of moa skeletons found in this particular ¼ acre of swamp on the property of Mr. Joseph Hodgen is 148, these figures considerably exceeding the number of skeletons known in all other museums of the world. The Pyramid Valley discoveries have aroused such widespread interest among the public that the authorities are planning to publish in the near future an illustrated brochure giving the full particulars.

Ferdinand von Hochstetter's reconstruction of the moa is the subject of an old steel engraving in the museum. This distinguished Austrian scientist visited New Zealand with the Novara expedition in 1858 to report on the country's geological features and had as one of his assistants the youthful but much-travelled Julius von Haast, who had arrived in the colony only the day before and was later to become Provincial Geologist and discoverer of the pass on the Otago-Canterbury mountain boundary which is named after him and founder of the Canterbury Museum. (He was also geologist for the Lyttelton tunnel scheme and was responsible for the discovery of artesian water beneath the city of Christchurch.)

### Gothic-style Building

The first portion of the present structure of mist-grey stone was erected in 1870 after the Gothic style. Success attended the venture from the outset and within the short space of 2 years a two-story wing was added, and in 1876 the second wing, as substantial as the first, was built to face the Antigua Street (now Rolleston Avenue) frontage, the entrance porch bearing the inscription, "Lo, these are parts of his ways: but how little a portion is heard of him." (The source of this happily-chosen inscription is the Book of Job, 26.14.)

## Literary Award Won with "Royal Visitors to New Zealand" Articles

THE New Zealand Women Writers' and Artists' Society's Browning Cup, a new literary award open for annual competition among society members, has been won this year by Mrs. E. B. V. Phillips, lady editor of the "Journal," for the best published prose from July, 1947, to June, 1949. The entry submitted by Mrs. Phillips was the series of articles "Royal Visitors to New Zealand," which appeared in the February, March, April, May, and June issues of the "Journal." Mrs. Phillips is perhaps better known to readers of the "Journal" as "Mary," under which name she has written articles for the women's section for the past 6 years.

The last permanent addition was made in 1882, only temporary buildings having been put up since, such as the shelter for the Maori House and an annexe for the largest skeleton of the largest species of whale in the world, the southern blue whale, which was washed ashore at Okarito, South Westland, in 1908. This skeleton is 87ft. long and is estimated to weigh 9 tons. In addition, a room was built for the relief model of Canterbury, occupying 1200 sq. ft., which was constructed by the Public Works Department for the New Zealand Centennial Exhibition in 1940 and which was the gift of the Government to the museum.

### Trilby the Tuatara

Although needing no larger abode than a corner of a showcase, Trilby the Tuatara successfully vies with the Okarito whale in popular interest, for his lineage dates back to when reptiles reigned supreme on the earth and mammals had not yet attained such gigantic stature and importance in the world of nature. Tuataras are a long-lived race and Trilby was no exception to this rule, being in all probability 200 years old when his owner, the redoubtable warrior chief Te Kooti presented him as a token of regard to Mr. A. M. Johnson, Opawa, in the early 1860's, and for fully 50 years he was the star attraction of Johnson's Fish Ponds. He still appeared to be hale and hearty at the time of the clearing sale in 1937, but he evidently

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Pyramid Valley, North Canterbury, where a record number of complete moa skeletons were unearthed by members of the staff of the Canterbury Museum.

did not take kindly to the change and he died shortly afterward; his remains now rest in state on a rock by a fleshy-footed shearwater (one of the sea petrels) in the museum.

The friendship between Hochstetter and Haast not only resulted in New Zealand's being exceptionally well represented in the Imperial Museum, Vienna, of which Hochstetter was appointed Director-General in 1876, but also led to valuable exchanges of material between European and New Zealand museums. Moreover, Hochstetter was instrumental in securing the services of his countryman Andreas Reischek, a taxidermist, to help Haast. Reischek found so much to interest him in the colony that he stayed 12 years instead of 2, and assisted with the arranging of the collections in the Auckland and Wanganui Museums as well. In company with his devoted dog, Caesar, he made many an expedition throughout the country and adjacent islands to collect specimens of native flora and fauna.

## Unique Collection

The relics of the "moa-hunters," the first "Maoris" to migrate here from Polynesia and a people whose existence was first demonstrated by Haast during his explorations in North Otago and Canterbury, form the nucleus of the unique collection now supplemented by the stone adzes, necklaces of moa-bone beads shaped like the teeth of sperm whales, pendants of whale ivory, and other prized possessions discovered by J. R. Eyles, then a schoolboy, at the Wairau Estuary, Marlborough, in 1939. In the course of digging for Maori relics in this district Eyles unearthed the burial place of the chiefs of the moa-hunters and thus enabled the museum to add invaluable specimens to its collection. Indeed, Dr. R. C. Murphy, of the American Museum of Natural History, New York, considers this exhibit cannot fail to thrill the most critically minded of museum men. The Chinese have a saying that one picture is worth 10,000 words, a truth peculiarly well demonstrated by all that is pictured to the mind's eye in that single museum case.

Te Rangitapua (King Tommy Solomon), the last of the Morioris. The Canterbury Museum has an excellent collection of relics of this race.

## Primitive Cultures

The Canterbury Museum possesses countless objects representative of the primitive cultures of other countries, and because of its close proximity to Lyttelton, the port used by all shipping to and from the Chatham Islands, situated some 400 miles east, it has acquired an excellent Moriori collection, including the replica of a carved wooden figure closely resembling Easter Island designs, the only known Moriori cloak, the only example of the Moriori quarter-staff, a large raft canoe, and quaint circular fish-hooks of stone. The inhabitants of these islands were an offshoot of the moa-hunters in New Zealand, betaking themselves to the islands during the moa-hunter period. They suffered dreadful decimation through the musket fire of invading Taranaki tribes in 1835 and from that time the race began to dwindle with disturbing rapidity. By 1933, with the death of jovial Te Rangitapua, King Tommy Solomon, a veritable mountain of a man who turned the scale at 28 stone, there was not a single Moriori of pure-blooded stock remaining.

A recent discovery which would rejoice the heart of any museum official, let alone a specialist in Maori and Polynesian ethnology like the Director of the Canterbury Museum, R. S. Duff, is an ancient wood carving cut with stone implements in totara which was dug up by C. C. Stanley during draining operations in a swamp midway between the Opihi and Orari rivers, near Temuka, and about 3 miles distant from the sea. It passed unnoticed amid the other finds of swamp totara and was recognised as of human handiwork only when Mr. Stanley was preparing to chop up the timber for firewood some weeks later. Fortunately the relic was spared from the axe and brought into the museum, where urgent treatment was given to ensure its preservation. At the present time the carving has no parallels in New Zealand and is possibly the earliest example known of the wood-carving art of the tribes who preceded the Maori fleet of 1350 A.D.

## Fine Arts Collections

Eastern civilisations are illustrated by fine arts collections, Mrs. W. A. Moore having donated much of the Japanese material collected by her father, the late Sir Joseph Kinsey, founder of the shipping firm and attorney for Scott's two polar expeditions and one of Shackleton's. (The shipping magnate's popularity with members of these polar expeditions can be gauged from the letter dated December 8, 1901, which Captain Scott wrote him shortly before the Discovery sailed from Lyttelton: "Champagne is, with us, a luxury reserved for **very** high days and holidays, but such 'occasions' have already occurred often enough to shew how much we all appreciate it. I may therefore in the name of my mess mates thank you most sincerely for your very kind present and assure you that nothing could be more acceptable. Our wine caterer (Dr. Wilson) is so stony hearted that I shall have to shew him your note to prevent the liquor being annexed as 'medical comforts.' We shall very cordially drink your health in the magnums and feel most grateful to think that you are honouring us at the same time. With thanks for your good wishes, believe me, Yours sincerely R. F. Scott." The missive, which bears the British Antarctic Expedition's royal-blue crest, a ship's lifebelt enclosing a solitary penguin standing on an ice-field, is now among the treasures of the Turnbull Library, Wellington.)

Some of Sir Joseph's cloisonne and jade curios are in the Chinese collection, which includes the late Staff-Sergeant-Major Sutherland's treasures from Pekin, gathered after the Boxer rebellion of 1900, and the Bailey collection of primitive metal ware (the pewter vessels belonging to the Ming period (1368-1644) being lacquered), early glazed ware dating from the T'ang, Sung, and Yuan dynasties (681-1368), and brilliantly-glazed Imperial porcelain of the period of Ch'ien Lung (1736-1775).

## Contributions from Rewi Alley

Among the articles forwarded from time to time by Rewi Alley, formerly of Christchurch and founder of the Chinese Industrial Co-operatives and famous Bailie School and experimental farm at Sandan, Central China, is an iron helmet worn by a Mongol warrior who fought under Genghis Khan, a bronze bowl and socketed adze belonging to the Han dynasty (206 B.C.-220 A.D.). T'ang bronzes and baked clay figures (681-906), sword coinage, the gold embroidered uniform of a Manchu Banner commander, a mandarin's hat and buttons of rank, and figures of deities from a lamasery in Inner Mongolia. Since the outbreak of civil war in China he has sent various additions to this material, which have been brought back to New Zealand and personally delivered to the museum by CORSO officials and members of the Friends' Ambulance Unit, his latest gifts being a celadon bowl of Sung porcelain (960-1279) and a piece of Chinese pottery of the neolithic period. Thanks largely to Rewi Alley the museum in his home town now has a complete display of Chinese ceramics from 3000 B.C. to 1700 A.D.

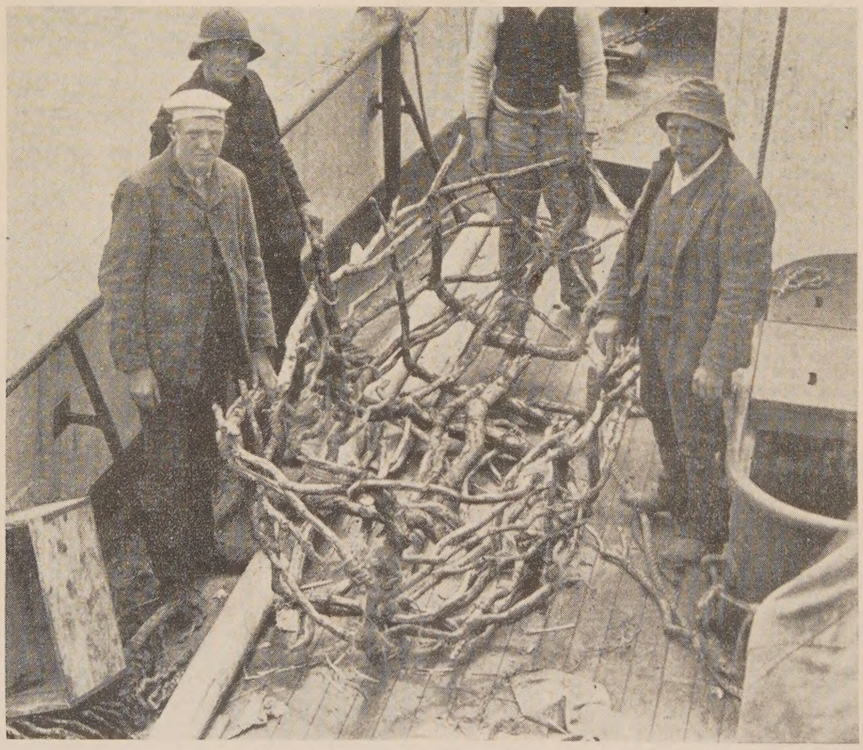
Mrs. Moore also contributed to the exhibits of English and Continental pottery, the late J. H. Seager being another benefactor. This section contains one of the 50 existing copies of the Portland vase reproduced by Josiah Wedgwood. The original, of carved onyx glass, was found in a Roman emperor's tomb; it was once the property of the Duke of Portland and is now in the British Museum, its purchase price being over 30,000 guineas.

## Ships Modelled to Scale

Of particular interest to masculine visitors is the series of ships modelled to scale, specially noteworthy being the Viking long boat from the period 600 A.D., the Santa Maria of Christopher Columbus (1492), a sailing ship fashioned in bone by French prisoners of war during the Napoleonic campaigns, Captain Cook's Resolution, in which he made his voyages of exploration in the Antarctic and the Pacific, the Bounty, commanded by Captain Bligh, whose crew mutinied on a trip to the South Seas to obtain specimens of the bread fruit tree, and the East Indiaman Charlotte Jane and her three sister ships which brought the first settlers to Canterbury in December, 1850.

[Frank McGregor photo.

One of the 50 replicas made by Josiah Wedgwood of the famous Portland vase. This replica, which is now in the possession of the Canterbury Museum, is the only one in New Zealand.



The rough coracle used by the castaways from the barque Dundonald in 1907 and now an exhibit in the Canterbury Museum.

## Dundonald Coracle

Most amazing of all is the Dundonald coracle, the crude framework being constructed of crooked sticks and covered with skin or cloth. It conveyed the castaways from the barque Dundonald, wrecked on Disappointment Island, west of the Auckland group, in March, 1907, to the main island, where there was a depot containing clothes and food. The museum is particularly rich in mementos of polar exploration, as Lyttelton was frequently a port of call for such expeditions.

A valuable Polynesian collection was obtained by the present Director during the visit to Britain which preceded his appointment. Acquired by gift or exchange from British museums, the artifacts include relics of the voyages of Vancouver and Cook and collections made by the Rev. William Ellis and other early workers of the London Missionary Society. The collections come from Hawaii, the Marquesas, Tahiti, and the Cook, Austral, and Tongan groups.

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## VETERINARY SERVICES COUNCIL

### Bursaries for Veterinary Students

The Veterinary Services Council is providing a maximum number of ten bursaries to enable students to commence a four years' course in veterinary science at the Veterinary School, Sydney University, in 1950.

The bursaries will provide for:—

(1) All university fees, together with an annual allowance for books and instruments.

(2) Return transport, if available, between New Zealand and Sydney annually.

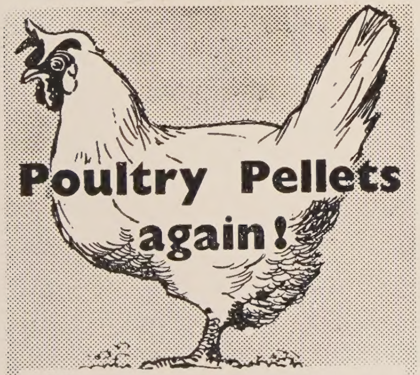
(3) Allowance of £3 a week during the academic year.

The gross value of the bursary in any one year shall not exceed £210. The net value of the bursary for the course will be £440, and all amounts in excess of this will be repayable in forty-eight equal monthly instalments after graduation of the bursar.

Applicants MUST have passed the Medical Intermediate Examination, or its equivalent in the required subjects—zoology, botany, physics, organic and inorganic chemistry. Preference will be given to candidates possessing experience with livestock. Bursars may be required to undertake approved practical training in New Zealand during the long vacation.

Continuation of the bursaries will be contingent on satisfactory reports from the Dean of the Faculty of Veterinary Science, Sydney. Bursars will require to enter into an agreement to return to New Zealand after graduation and serve in an approved veterinary capacity for a period of five years.

Applications, addressed to the Secretary, Veterinary Services Council, P.O. Box 866, Wellington, giving particulars of age, qualifications and experience will be received up to December 20, 1949.



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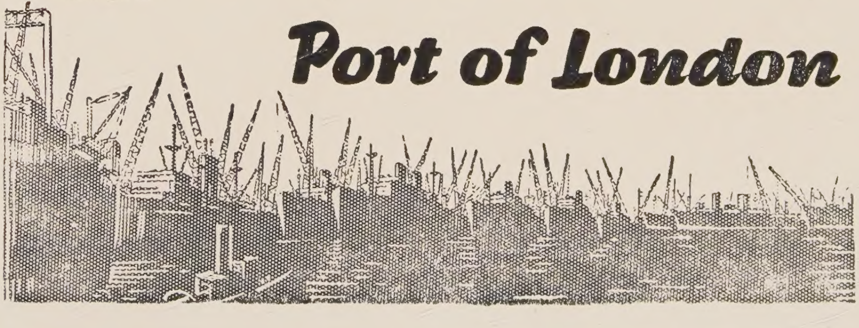

*Where does*

**EUROPA**

*Petrol come from?*

*From the*

**BRITISH**

*Protectorate of Bahrein*
*in the Persian Gulf . .*

E. G. 8